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December 11, 2001

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Magalie Roman Salas, Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: Part 25 Streamlining Proceeding, IB Docket 00-248

NOTICE OF EX PARTE PRESENTATION

Dear Ms. Salas:

Today, the undersigned, Joslyn Read, Ken Sahai, and John Stein of Hughes Electronics Corporation d/b/a Hughes Network Systems, John Stern and Young Lee of Loral Space and Communications LTD, Kalpak Gude and Donna Bethea of PanAmSat Corporation, Joe Godles of Goldberg, Godles, Wiener and Wright, Paul Holland of Starband Communications Inc., and Jaime Londono of SES Americom (formerly GE American Communications, Inc.) met with Anna Gomez, Ron Repasi, Fern Jarmulnek, Steven Spaeth, John Martin, and Sylvia Lam of the International Bureau. The topic of discussion was the attached Supplemental Comments to the Proposed Revisions of the Satellite Industry Association, concerning proposed modifications to the Part 25 rules, that was presented at the meeting. A copy of this letter with the attachment will be provided to each of the members of the International Bureau identified above.

Respectfully submitted,

/s/ Dori K. Bailey

Dori K. Bailey
of LATHAM & WATKINS

Enclosure

Supplemental Comments to the Proposed Revisions of the Satellite Industry Association Part 25 Streamlining Proceeding IB Docket 00-248

December 10, 2001
Final Version

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Supplemental Comments to the
Proposed Revisions of the Satellite Industry Association
Part 25 Streamlining Proceeding
IB Docket No. 00-248

Introduction

In response to the Commission's streamlining proposals in its Notice of Proposed Rulemaking in this proceeding,[1] the Satellite Industry Association ("SIA") filed a set of Proposed Revisions to Part 25 of the Commission's Rules.[2] These proposed revisions provide consensus technical modifications to the Part 25 rules. The SIA and many of its members were very active in the earlier stages of this proceeding, and many indicated in their comments that an industry group should be formed to reach consensus on the various technical issues. The SIA Proposed Revisions are the result of a series of meetings among industry members to fashion a set of rules that respond to the Commission's proposals to streamline Part 25. We now are pleased to present the Supplemental Comments to the Proposed Revisions of the Satellite Industry Association. These Supplemental Comments provide a complete discussion regarding each of the SIA's proposals.

A. Proposed Uplink Power Spectral Density Levels

As the Commission notes in the NPRM, advances in technology have permitted the use of smaller aperture VSAT earth station antennas while still maintaining service performance. Smaller aperture antennas are less expensive, can be installed in a wider range of

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1 *In the Matter of Biennial Regulatory Review – Streamlining and Other Revisions of Part 25 of the Commission's Rules Governing the Licensing, and Spectrum Usage by, Satellite Network Earth Stations and Space Stations*, FCC 00-435, IB Docket No. 00-248 (released Dec. 14, 2000) ("NPRM").

2 Proposed Revisions of the Satellite Industry Association, Part 25 Streamlining Proceeding, IB Docket No. 00-248, filed November 5, 2001 (marked to show changes from the Commission's proposals in the NPRM). This document along with a clean copy

locations, and are more attractive to the end user.[3] From an operational standpoint, these smaller antennas (having dimensions less than 1.8 meters in the geostationary satellite orbital plane)[4] have less mainbeam gain and therefore require the flexibility to increase transmit power to respond to service demands. The SIA believes that increases in transmit power can be accommodated, without an unacceptable increase in interference to adjacent satellite networks, as long as these earth station antennas can meet an improved sidelobe performance standard. Thus, earth station operators would have the flexibility to increase their power depending on the nature of their antenna masks.

Therefore, the SIA proposes to permit a VSAT earth station antenna with a dimension less than 1.8 meters in the geostationary satellite orbital plane to increase transmit power by up to an additional 2 dB from the current routine processing limit of –14.0 dBW/4kHz, provided the antenna meets the following improved sidelobe performance standard. Specifically, the maximum uplink power spectral density for routine processing of VSAT applications in the 14 GHz band shall not exceed –14.0 +X-10log(N)dB(W/4kHz) for a digital modulated carrier. For antennas with dimensions less than 1.8 meters in the geostationary satellite orbital plane, "X" is a value from 0 to 2 dB, which corresponds to the following improved antenna sidelobe performance standard in the plane of the geostationary orbit:[5]

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of the SIA's Proposed Revisions are attached to these Comments at the Appendix ("SIA Proposed Revisions").

3 *See generally* NPRM ¶12.

4 The SIA believes that it is more precise to refer to antennas by their dimensions in the geostationary plane, rather than by reference to the diameter of a circular antenna with an equivalent reflector surface area. Thus, the Commission should not adopt its proposed definition of "equivalent diameter." *See* NPRM, app. B §25.201(b)(7).

5 *See* SIA Proposed Revisions § 25.134(a)(1). For antennas with dimensions of 1.8 meters in the geostationary satellite orbital plane, X is equal to zero, and the use of this maximum power spectral density will be associated with the antenna patterns in

(29-X) –25logθ	dBi	Y° ≤ θ ≤ 7°
(+8-X)	dBi	7°<θ ≤ 9.2°
(32-X) –25logθ	dBi	9.2°<θ ≤ 48°
(-10-X)	dBi	48°<θ ≤ 85°
0	dBi	85°<θ ≤ 180°[6]

The value for "Y" is described further below.

For example, if a VSAT earth station applicant with an antenna dimension less than 1.8 meters in the geostationary satellite orbital plane wishes to increase transmit power by an additional 2 dB (-14+2-10log(N)dB(W/4kHz)), then the applicant must meet the following antenna gain mask in the plane of the geostationary satellite orbit:

(29-2) –25logθ	dBi	Y° ≤ θ ≤ 7°
(+8-2)	dBi	7°<θ ≤ 9.2°
(32-2) –25logθ	dBi	9.2°<θ ≤ 48°
(-10-2)	dBi	48°<θ ≤ 85°
0	dBi	85°<θ ≤ 180°

Thus, increasing the transmit power by 2 dB while decreasing the gain of the antenna by the same amount at certain off-axis angles will not cause any increase in adjacent satellite interference. Therefore, antennas meeting these requirements should be routinely processed.

This improved antenna sidelobe performance standard differs from the existing sidelobe performance standard set forth in Section 25.209(a)(1) of the Commission's Rules in three ways. First, the gain of the antenna at certain off-axis angles may be reduced by a value from 0 to 2 dB depending upon the level of transmit power required. Second, for antennas with dimensions from 1.2 to less than 1.8 meters in the geostationary satellite orbital plane, the off-

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§25.209(a) and (b) of the Commission's Rules and the SIA's proposed §25.209(g)(1)(ii). For antennas with dimensions greater than 1.8 meters in the geostationary satellite orbital plane, X also equals zero, and the use of this maximum power spectral density will be associated with the antenna patterns in §25.209(a) and (b). The SIA believes that these larger antennas (having a dimension of 1.8 meters or greater in the geostationary satellite orbital plane) do not require an increase in transmit power at this time.

axis angle ("Y") starts at 1.25 degrees which corresponds to the current antenna performance standards for small antennas operating in the Ku-band. For antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane, the off-axis angle begins at 1.5 degrees.[7]

The Commission currently permits 1.2 meter antennas in the Ku-band to comply with a sidelobe antenna gain pattern beginning at 1.25 degrees rather than 1 degree because the Commission found that this relaxed standard would not cause unacceptable levels of interference to adjacent satellite systems. In that decision, the Commission determined that "relaxing" the Section 25.209(a)(1) mask would facilitate the wide deployment of the then-new 1.2 meter antennas.[8]

Advances in earth station and satellite technology over the past decade have resulted in antennas smaller than 1.2 meters that can meet a sidelobe envelope beginning at 1.5 degrees off-axis. Therefore, further relaxation of the Section 25.209 mask, by beginning the off-axis angle at 1.5 degrees for antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane, is consistent with the Commission's policy of relaxing the antenna gain pattern standards to reflect advances in technology that permit smaller antennas to operate without resulting in increased levels of unacceptable interference. Currently, no satellites that serve the U.S. operate closer than 1.9 degrees. Thus, antennas that conform to an antenna gain pattern beginning at 1.5 degrees off-axis should be routinely licensed. This proposed 1.5 degree

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6 *See* SIA Proposed Revisions §25.134(a)(2)(i).

7 For antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane which have an off-axis angle starting between 1.5 and 1.8 degrees, X is equal to zero. These antennas are compliant with the SIA's proposed §25.209(g) but do not at this time meet the proposed characteristics for an increase in transmit power. *See* SIA Proposed Revisions §25.134(a)(2)(v); *see also* SIA Proposed Revisions §25.134(g).

8 *See generally* NPRM ¶11 n.19.

standard reflects a compromise, based on industry experience, between antenna installation complexities and the potential for adjacent satellite interference.

The third change proposed by the SIA is to replace the –10 dBi value in the last equation in Section 25.209(a) with 0 dBi for off-axis angles greater than 85 degrees. This would provide relief to the rise in the sidelobes resulting from the spill over effect in offset fed antennas. The Ku-band is not shared with terrestrial services; thus, this change would not result in an increase in interference to terrestrial service operators. In addition, the interference environment with respect to adjacent satellites would not be affected because the other GSO satellites located beyond 85 degrees off-axis are not visible to the earth station.

In all other directions outside the plane of the geostationary satellite orbit, a VSAT earth station applicant that wishes to increase transmit power by an additional 2 dB must meet the following antenna gain mask:

$(32-X)-25\log\theta$	dBi	$Z° \leq \theta \leq 48°$
(-10-X)	dBi	$48° < \theta \leq 85°$
0	dBi	$85° < \theta \leq 180°$[9]

The SIA proposes that for antennas with the smallest dimension of the aperture[10] greater than or equal to 1.2 meters, the off-axis angle starts at 1 degree which corresponds to the current antenna performance standards set forth in Section 25.209(a)(2) of the Commission's Rules. For antennas with the smallest dimension of the aperture less than 1.2 meters, the SIA proposes to relax the Commission's standards by beginning the off-axis angle at 3 degrees. Relaxation of the antenna gain in the non-geostationary planes to start at 3 degrees off-axis will allow routine licensing of widely used rectangular and elliptically shaped antennas.

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9 *See* SIA Proposed Revisions §25.134(a)(2)(ii).

This 3 degree proposal is due to the fact that the elliptical and rectangular antenna's physical dimension in the non-GSO plane is narrower than the GSO plane dimension. The value of 3 degrees was selected to be consistent with the performance of these elliptical and rectangular antennas meeting the proposed starting angles in the plane of the geostationary arc. These antennas have an aspect ratio (ratio of major to minor dimension) of approximately 2:1. Moreover, this value is consistent with ITU Radio Regulation Article S22.26, which establishes certain off-axis angle EIRP levels starting at 3 degrees. Thus, antennas that comply with an antenna gain mask in the non-geostationary planes starting at 3 degrees off-axis will not cause interference to other satellite systems.

The SIA proposes that a manufacturer's certificate will accompany all applications proposing to employ a maximum input power spectral density of –14.0 +X-10log(N)dB(W/4kHz) for values of X greater than zero. These certificates must indicate that the results of a series of radiation pattern tests performed on representative equipment in representative configuration demonstrate that the equipment complies with the improved sidelobe performance standards discussed above.[11]

B. Random Access Techniques

As discussed above, the SIA proposes a maximum input power spectral density limit for VSAT earth stations in the 14 GHz band of –14.0 +X-10log(N)dB(W/4kHz) for a digital modulated carrier. The SIA agrees with the Commission's proposal to provide different values of "N" for VSAT networks using frequency division multiple access ("FDMA") and time

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10 The SIA proposes to define the size of these antennas by the "smallest dimension of the aperture" to accommodate rectangular, elliptical and other non-circular antennas.

11 *See* SIA Proposed Revisions §25.134(a)(2)(iv). The SIA also proposes an improved sidelobe performance standard for the off-axis cross-polarization of the antenna. *See* SIA Proposed Revisions §25.134(a)(2)(iii).

division multiple access ("TDMA") techniques and for networks using code division multiple access techniques ("CDMA").[12] Thus, for a VSAT network using FDMA or TDMA techniques, N is equal to one. For a VSAT network using CDMA techniques, N is the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.[13]

The Commission also proposes to specify different values of "N" for systems using Aloha multiple access techniques. Specifically, the Commission proposes to require a reduction in the power spectral density emitted by earth stations using Aloha random access techniques by 3 dB from the existing limits (i.e., N=2 for Aloha systems).[14] The Commission also invites comment on extending multiple access rules to C-band VSAT ("CSAT") networks, and on revising the Ka-band blanket licensing rules to incorporate requirements for the Aloha access technique.[15]

As the SIA stated in its Reply Comments, the satellite industry opposes the Commission's proposed 3 dB power reduction for Ku-band VSAT earth stations using Aloha random access techniques, and any extension of this proposal to the C-band or the Ka-band.[16] As set forth in detail in the Hughes Comments, a drastic 3 dB reduction in power for earth stations employing random access techniques is not necessary from a technical perspective.[17] In

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12 *See* NPRM ¶55.

13 *See* SIA Proposed Revisions §25.134(a)(1).

14 *See* NPRM ¶56.

15 *See* NPRM ¶57.

16 Reply Comments of the Satellite Industry Association, IB Docket 00-248, filed May 7, 2001, at 12 ("SIA Reply Comments").

17 *See* Joint Comments of Hughes Network Systems, Hughes Communications, Inc. and Hughes Communications Galaxy, Inc., IB Docket 00-248, filed March 26, 2001, at 19-21, app. A ("Hughes Comments").

addition, the SIA believes that the proposed 3 dB reduction in power could significantly undermine the commercial viability of VSAT networks and other planned satellite services.[18] Thus, the SIA recommends that the Commission not adopt the proposed power reduction provisions set forth in the proposed Section 25.134(a)(1) in the NPRM.[19]

The SIA members and other companies joining in these Comments represent every segment of the satellite industry, including earth station operators, satellite operators and equipment manufacturers. As indicated in the SIA's Reply Comments, this broad cross-section of the satellite industry has not reported a single problem with the use of random access techniques and uniformly opposes the Commission's proposed 3 dB reduction in power for earth stations using industry-standard access techniques.[20] For example, GE Americom stated that "it supports allowing the use of random access techniques" and that its "experience has been that such operations have not resulted in unacceptable interference."[21] Similarly, Loral indicated that it "is not aware of any reported incidents of unacceptable interference attributable to the operation of these networks at the current 'blanket licensing' levels"[22] and "believes that this proposal may be unnecessary."[23] In addition, Hughes indicated that the "Commission's proposal

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18 SIA Reply Comments at 12.

19 NRPM, app. B, §25.134(a)(1)(iii), (a)(1)(iv); *see also* SIA Proposed Revisions §25.134(a)(1).

20 SIA Reply Comments at 12.

21 *See* GE American Communications, Inc., IB Docket 00-248, filed March 26, 2001, at 4 ("GE Americom"). GE Americom is now known as SES Americom.

22 *See* Comments of Loral Space and Communications LTD, IB Docket 00-248, filed March 26, 2001, at 11-12 ("Loral Comments").

23 *Id.* at 11.

would be a radical change to the existing rules and appears to be a solution to a problem that does not exist."[24]

Moreover, any increase in the deployment of earth stations as a result of the Commission's streamlining proposals or the adoption of the SIA Proposed Revisions would not cause an increased risk of interference attributable to random access techniques.[25] As the SIA stated in its Reply Comments, successful implementation of random access techniques requires that the probability of collision be kept low,[26] and initial analysis suggests that the probability of harmful interference is less than 1% (the criterion suggested by the Commission).[27] To maintain this negligible probability of collision, consumer terminals are spread out over a sufficient number of transponders so that customer-to-transponder ratios are approximately the same as they have been traditionally. Furthermore, any additional increase in the number of terminals would result in *fewer* transmissions per second for each terminal, rather than an increased number of collisions.[28] Thus, as stated by Spacenet/Starband, the "Commission's proposed

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24 *See* Hughes Comments at 22.

25 *See id.* at 21; *see also* Comments of Spacenet Inc. and StarBand Communications, Inc. at 37-38 ("Spacenet/StarBand Comments").

26 *See* SIA Reply Comments at 13. As noted by Spacenet/Starband, "[n]etworks are designed to accommodate the expected maximum traffic, and incorporate some form of congestion control to prevent exceeding the design loading." Spacenet/StarBand Comments at 37. Furthermore, unless "VSAT systems [are] designed so that the collision rate is reasonably low, . . . the service performance will be poor" and ultimately rendered "commercially unacceptable." Hughes Comments at 21; *see also* Spacenet/Starband Comments at 38. Therefore, in order to operate a commercially viable service, the loading of VSAT networks that use random access techniques generally will remain constant regardless of the number of terminals deployed. *See generally* Hughes Comments at 21.

27 *See* NPRM, app. E, §III(E) ("[U]nder the conditions proposed by Spacenet (Poisson distribution with 38% channel load), we determine that a smaller than 1 % probability of carrier collision would be acceptable as a good tradeoff.")

28 *See* Hughes Comments at 21.

regulatory intrusion is unnecessary; the industry's need to assure a service that is competitive with wireline and other terrestrial services will preclude excessive collisions."[29]

As noted in the SIA Reply Comments, the industry agrees that the Commission's proposed 3 dB reduction in power for networks using industry-standard access techniques would have a significant adverse impact on VSAT networks. As stated by Astrolink, a "3 dB reduction in power density or off-axis e.i.r.p. density levels would render many satellite links unusable, or at a minimum, seriously affect a system's achievable availability and capacity."[30] Hughes confirmed that "VSAT networks do not have 3 dB, or in many cases even 1 dB, of *excess* link margin to be sacrificed for these purposes.[31] Thus, the Commission's belief that this lower power level "would provide a technically viable service"[32] is not supported by the industry. Moreover, the Commission has not put forth any evidence to warrant this position.

One commenter, Aloha Networks, proposed an alternative theoretical approach to limiting the probability of collisions associated with random access transmissions.[33] Despite substantiated industry opposition to both this alternative approach and the Commission's proposals, Aloha Networks filed a recent ex parte presentation aimed at persuading the Commission that a need exists for regulating multiple access techniques.[34] However, the only

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29 *See* Spacenet/StarBand Comments at 38.

30 Comments of Astrolink International LLC, IB Docket 00-248, filed March 26, 2001, at 12 ("Astrolink Comments").

31 Hughes Comments at 22.

32 NPRM ¶56.

33 Comments of Aloha Networks, Inc., IB Docket No. 00-248, filed March 26, 2001, at 8-10 ("Aloha Comments").

34 Ex Parte Presentation of Aloha Networks, Inc., IB Docket No. 00-248, filed November 14, 2001 ("Aloha Ex Parte").

information that Aloha Networks provides to support its position is anecdotal.[35] Moreover, Aloha Networks does not address the industry's analysis, discussed above as well as in the SIA Reply Comments and in other industry comments in this proceeding, which demonstrates that an increase in the number of VSAT terminals will not increase the risk of adjacent satellite interference attributable to multiple access techniques. Therefore, the SIA again urges the Commission not to adopt the proposals made by Aloha Networks. As discussed in these Comments, the SIA Reply Comments, and in every other industry comment addressing this issue, there continues to be no demonstrable need to impose any regulation (either the Commission's proposals or those of Aloha Networks) to solve a problem that does not exist today and will not likely exist in the future.[36]

Thus, the Commission should not adopt its proposal to reduce the power for VSAT networks using random access techniques. Industry comments overwhelmingly demonstrate that the Commission's proposed 3 dB reduction is unnecessary and would significantly and adversely affect the commercial viability of VSAT networks.

C. Proposed Downlink EIRP Spectral Density Levels

As recognized by the Commission, the size of earth station antennas have decreased over the years but the power spectral density requirements of the Commission's Rules have remained the same.[37] As noted in the NPRM, a decrease in the size of the antenna will decrease the mainbeam antenna gain. As a result, a higher downlink EIRP density may be

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35 *See id.* at 4.

36 As stated in the SIA Reply Comments, should the Commission nevertheless decide to place limits on the emissions from networks as a whole, SIA asks the Commission to implement such regulation in the form of a limit on the average power radiated toward the target satellite by the network, as proposed by Hughes in its comments in the Spacenet Petition proceeding. *See* SIA Reply Comments at 14-15 n.41.

needed to close the satellite communication link.[38] Thus, as noted by Hughes and supported by every other commenter addressing this point, "an increase in the downlink EIRP density limit in certain circumstances would be an appropriate progression of the Commission's Rules and would respond to the advances in technology that have permitted the manufacture and deployment of smaller antennas."[39] In addition, the SIA believes that more than one level of downlink EIRP density may be appropriate to meet the demand for different services and accommodate technological advances in the satellite industry.

Therefore, the SIA proposes to increase the maximum downlink GSO FSS satellite EIRP spectral density limit for outbound digital modulated emissions from 6 dBW/4kHz to 9 dBW/4kHz for routine processing of all methods of modulation and accessing techniques. This limit would be applicable to all VSAT and individual earth station operations in the 12/14 GHz band.[40]

As stated by Spacenet/StarBand, advances in satellite design have resulted in a higher number of Ku-band transponders per satellite than at the time the Commission established the existing power density limits. The increased number of transponders per satellite has

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37 NPRM ¶39.

38 NPRM ¶40.

39 Hughes Comments at 15; *see also* Comments of Spacenet/Starband at 32 ("[T]he proposal to increase downlink EIRP densities for digital carriers will increase the efficiency of Ku-Band satellite service in general by taking advantage of improvements in satellite technology."); *see generally* Loral Comments at 10 ("Loral supports an increase in downlink power density levels for VSAT services . . . ."); Comments of PanAmSat Corporation, IB Docket No. 00-248, filed March 26, 2001, at 9 ("PanAmSat believes that a relaxation of these power limits is warranted.") ("PanAmSat Comments").

40 *See* SIA Proposed Revisions §25.134(a)(3).

permitted the bandwidth per transponder to decrease to 36 MHz.[41] The SIA agrees with Spacenet/StarBand that "[w]hile . . . satellite improvements have enabled narrower bandwidths per transponder, and thus enabled more transponders per satellite, the reduced bandwidth per transponder also has the effect of increasing the power density available per transponder."[42] Moreover, as noted by Hughes, "[c]urrent GSO FSS satellites exhibit peak EIRPs in the range of 49 to 52 dBW . . . [thus,] [t]he operation of 36 MHz transponders at an EIRP spectral density of 6 dBW/4kHz results in substantial underutilization of the available power."[43] The SIA's proposed increase to 9 dBW/4kHz would improve the efficiency and overall performance of today's advanced satellite systems and would permit the use of QPSK or higher modulation carriers with existing and smaller VSAT antennas.[44]

The SIA agrees with Hughes that the proposed increase to 9 dBW/4kHz, even if applied to all VSAT related outroute carriers (those carriers transmitted by a hub earth station and received by VSATs), would not cause unacceptable levels of harmful interference to existing systems operating at the 6 dBW/4kHz limit.[45] A typical VSAT link budget for the outroute transmission, BPSK modulated, rate ½ Forward Error Correcting (FEC) coding, is designed for 99.7% propagation availability.[46] This implies about 2.0 dB of clear-sky link margin for a

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41 Spacenet/ StarBand Comments at 33; *see also* Hughes Comments at 16 ("Current GSO FSS satellites . . . have transponder bandwidths of 27 to 54 MHz, with 36 MHz being the most common.").

42 Spacenet/StarBand Comments at 33.

43 Hughes Comments at 16.

44 *See generally* Spacenet/StarBand Comments at 33-34; *see also* Hughes Comments at 15.

45 *See* Hughes Comments at 15-16, app. A; *see also* PanAmSat Comments at 9-10 (concluding that an increase in downlink EIRP density to –26dBW/Hz (+10dBW/4kHz) would result in a tolerable level of adjacent satellite interference).

46 Separate margin allowances would be included for antenna pointing errors and various other static degradations. These are not included in this discussion.

typical site in Crane Rain Region D2, including the effect of added sky noise during rain. Under clear-sky conditions, the total noise contribution from the four adjacent satellite systems[47] accounts for about 11 % of the total noise budget, assuming that the wanted carrier and the carriers operating on the adjacent satellites are all transmitting at 6 dBW/4kHz. This also assumes that the receiving antenna just exactly meets the applicable sidelobe envelope. An increase in the adjacent carriers to 9 dBW/4kHz while the wanted carrier remains unchanged would degrade the clear sky C/N[48] by 0.4 dB, and the faded C/N by 0.3 dB.[49] SIA believes this a small increase that could be accommodated by most systems, and which results from the worst-case scenario of all adjacent carriers operating at 9 dBW/4kHz. Thus, an increase to 9 dBW/4kHz would not cause unacceptable levels of harmful interference to existing systems operating at the 6 dBW/4kHz limit.

To accommodate the demand for smaller antennas suitable for small business and consumer use, the maximum downlink GSO FSS satellite EIRP spectral density limit for outbound digital modulated emissions may be further increased to 13 dBW/4kHz for all methods of modulation and accessing techniques, provided that the target satellite operator has successfully coordinated this power level with adjacent satellite operators. This higher power level would permit the provision of services with the smallest antennas to the largest region of the contiguous United States ("CONUS").[50] This limit would be applicable to all VSAT and individual earth station operations in the 12/14 GHz band. (Operations at 13 dBW/4kHz are envisioned as full transponder services, with all or most of the transponder occupied and the

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47 Those satellite systems that are 2 degrees and 4 degrees to either side.

48 C/N refers to the carrier to noise ratio.

49 *See* Hughes Comments at 15-16, app. A.

transponder operated at or very near saturation.) Applications for these services, that have been successfully coordinated, would be routinely licensed.[51]

While antennas utilizing this 13 dBW/4kHz downlink EIRP spectral density will be communicating only with the satellites which have coordinated this higher power, the SIA would like to clarify that use of this higher power level would not preclude "ALSAT" status for the earth station, so long as the ALSAT authorization made clear that, absent coordination with adjacent satellite operators for an increase up to 13 dBW/4kHz, the maximum downlink EIRP spectral density would be 9 dBW/4kHz. SIA notes that, at present, there is no question in FCC Form 312 requesting maximum downlink EIRP spectral density information from earth station applicants.[52]

D. Proposed Antenna Performance Standards

As noted by Hughes, when the Commission first instituted the Part 25 rules, the prospect of deploying an antenna less than 1.2 meters was simply not envisioned. Since then, the industry has deployed tens of thousands of antennas smaller than 1.2 meters, and the trend toward smaller, more efficient terminals is increasing.[53] To address this rapidly changing technological environment, the SIA proposes that the definition of "routine" earth station applications for operation in the 12/14 GHz band be expanded to include those earth stations that

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50 In certain areas of the CONUS, operations at 9 dBW/4kHz would require a larger antenna which is impractical for home or small business use.

51 *See* SIA Proposed Revisions §25.134(a)(4).

52 The SIA wishes to correct the statement in its Overview of Major Proposed Revisions of the Satellite Industry Association dated November 19, 2001 which indicated that these antennas would not receive an ALSAT designation.

53 *See generally* Hughes Comments at 5.

conform to the modified antenna gain patterns of the SIA's proposed Section 25.209.[54] The SIA believes that the antenna performance standards should reflect the unique characteristics of antennas operating in both the transmit and the receive bands. Thus, for purposes of routine processing, the SIA proposes to apply separate performance standards for antennas receiving in the 12 GHz band and for those transmitting in the 14 GHz band.

Industry comments overwhelmingly support a change in the antenna performance standards. PanAmSat "agrees with the Commission that the current rules are unduly restrictive, and favors making it easier for [currently] non-conforming earth stations to be licensed."[55] PanAmSat states that it "would support a change in the off-axis angle," and notes that "[b]y changing the starting point for the 29-25 log theta requirement . . . many more small earth stations could be authorized on a routine basis . . . ."[56] As noted by StarBand/ Spacenet, amending the starting point for the Section 25.209 antenna gain pattern "to allow the routine licensing of Ku band VSAT earth stations . . . will accomplish meaningful and effective streamlining by substantially reducing the burden both on the applicants who seek to license smaller antennas and on the Commission's staff who process the applications."[57] Hughes also "proposes to modify the current rules to include some of these smaller (less than 1.2 meter) VSAT antennas in the category of 'routine' Ku band earth station applications"[58] and supports separate standards for the transmit and the receive bands.[59] Thus, the industry fully supports

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54 *See* SIA Proposed Revisions §25.209.

55 PanAmSat Comments at 3.

56 *Id.* at 3-4.

57 *See generally* Spacenet/Starband Comments at 12.

58 Hughes Comments at 4.

59 *See id.* at 5, 9.

expanding the definition of routine processing to include earth stations that conform to a modified antenna gain pattern.

Therefore, the SIA proposes to modify the antenna performance standards for the 14 GHz band by beginning the off-axis angle at 1.5 degrees (instead of the current 1 degree) for antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane.[60] SIA believes this is an appropriate response to advances in technology which have permitted smaller earth station antennas to comply with a sidelobe envelope beginning at 1.5 degrees off-axis. Almost ten years ago, the Commission recognized that "[a]lthough an antenna 1.2 meters in diameter does not fit within the envelope established in Section 25.209(a)(1) between 1 degree and 1.25 degrees off-axis, . . . this slight failure to meet the Commission's antenna gain standards does not generally cause unacceptable interference."[61] Thus, the Commission revised the sidelobe envelope for a 1.2 meter antenna operating in the Ku-band to start at an off-axis angle of 1.25 degrees rather than 1 degree.[62]

Technology is continuing to evolve and antennas smaller than 1.2 meters now present an efficient, less costly means of providing satellite broadband service to small businesses and consumers who would not otherwise be able to receive those services. Therefore, beginning the off-axis angle at 1.5 degrees for antennas in the 14 GHz band with dimensions less than 1.2 meters in the geostationary satellite orbital plane is a logical next step to the Commission's decision almost ten years ago for 1.2 meter antennas.

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60 *See* SIA Proposed Revisions §25.209(g)(1)(i).

61 NPRM ¶11 n.19 (*citing* 47 C.F.R. §25.209(g); *Amendment of Part 25 of the Commission's Rules and Regulations to Reduce Alien Carrier Interference Between Fixed-Satellites at reduced Orbital Spacings and to Revise Application Procedures for Satellite Communication Services*, Second Report and Order and Further Notice of Proposed Rulemaking, CC Docket No. 86-496, 8 FCC Rcd 1316, 1322 ¶¶38-39 (1993)).

As the SIA has noted above, currently no satellites that serve the U.S. are in orbit less than 1.9 degrees apart. Thus, consistent with the compromise discussed above in Section A of these Comments, applications to operate earth stations in the 14 GHz band with antenna dimensions less than 1.2 meters in the geostationary satellite orbital plane that comply with a sidelobe envelope starting at 1.5 degrees off-axis should be routinely processed and receive an ALSAT designation.[63]

The SIA notes that the industry also successfully operates other small (less than 1.2 meter) antennas with different technical characteristics. These antennas meet an antenna gain mask starting at greater than 1.5 degrees and up to 1.8 degrees. The SIA proposes that applications for these antennas also should be routinely processed provided that the operations are coordinated with adjacent satellite operators within 3 degrees. Thus, routine processing would be provided for antennas operating in the 14 GHz band with dimensions less than 1.2 meters in the geostationary satellite orbital plane that comply with the antenna performance standards starting at greater than 1.5 degrees and less than or equal to 1.8 degrees off-axis, as long as the antennas are coordinated with the satellite operators within 3 degrees. These antennas would not receive an ALSAT designation.[64]

Moreover, as discussed above, currently no satellites that serve the U.S. operate at closer than 1.9 degrees. These less than 1.2 meters antennas comply with the antenna gain mask at off-axis angles starting at no greater than 1.8 degrees. Therefore, adjacent satellite operators located at 4 and 6 degrees from the target satellite will not experience any additional interference

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62 *Id.*

63 *See* SIA Proposed Revisions §25.209(g)(1)(i).

64 *See* SIA Proposed Revisions §25.209(g)(1)(i).

from the operation of these antennas. Thus, satellite operator coordination is required only for those satellites within 3 degrees.

The SIA also proposes that the off-axis angle for antennas operating in the 14 GHz band with dimensions from 1.2 to less than 1.8 meters in the geostationary satellite orbital plane will begin at 1.25 degrees, consistent with the current antenna performance standards for small antennas operating in the Ku-band.[65] The SIA believes that the characteristics of larger antennas (having a dimension of 1.8 meters or greater in the geostationary satellite orbital plane) are such that a relaxation in the off-axis angle is not required.

In all other directions outside the main beam, the SIA proposes to relax the antenna performance standards for smaller antennas (having a dimension less than 1.8 meters in the geostationary satellite orbital plane) by beginning the off-axis angle at 3 degrees.[66] As discussed above, relaxation of the Section 25.209 mask in the non-geostationary planes will permit routine licensing of rectangular and elliptically shaped antennas. This 3 degree proposal is due to the fact that the elliptical and rectangular antenna's physical dimension in the non-GSO plane is narrower than the GSO plane dimension. The value of 3 degrees was selected to be consistent with the performance of these elliptical and rectangular antennas meeting the proposed starting angles in the plane of the geostationary arc. These antennas have an aspect ratio (ratio of major to minor dimension) of approximately 2:1. Moreover, this value is consistent with ITU Radio Regulation Article S22.26, which establishes certain off-axis angle EIRP levels starting at 3 degrees. Thus, earth station antennas operating in the 14 GHz band that meet the antenna performance standards beginning at an off-axis angle of 3 degrees in the non-geostationary planes will not cause interference to other satellites.

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65 *See* SIA Proposed Revision §25.209(g)(1)(i); *see also* 47 C.F.R. §25.209(g).

SIA also proposes a new Section 25.209(g)(1)(ii). SIA developed this modification to the antenna performance standards in §25.209 to recognize the physical characteristics of these small earth station antennas, with dimensions in the GSO plane of 1.8 meters or less. Specifically, scattering of radiation off the feed arm structure or spillover energy from the feed horn results in higher sidelobe levels at angles very far off-axis for these small dimension antennas. Spillover energy is the radiation to, or from, the feed horn which is not captured, or blocked, by the main reflector. As a result of this spillover radiation or reflections off the feed arm structure, smaller antennas cannot effectively meet the –10 dBi requirement. This difficulty is recognized in the most recent antenna patterns developed in the ITU-R Recommendations (Recommendation ITU-R S.1428, which recommends a relaxation of the –10 dBi level). Furthermore, as the angular separation to other GSO satellites is so great (i.e., more than 85 degrees), the modification will not affect other FSS systems adversely. In addition, the modification applies only to frequency bands not shared on a co-primary basis with terrestrial services, thus removing any potential impact to terrestrial systems. Based on these considerations, SIA proposes to include §25.209(g)(1)(ii) to take into account the characteristics of these small earth station antennas.

To accommodate the unique technical characteristics of small receive antennas, the SIA proposes to apply a different prerequisite to routine processing. Specifically, antennas operating in the 12 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane will be *deemed* to meet the receive antenna performance standards of Section 25.209(a) of the Commission's Rules and the SIA's proposed Section 25.209(g)(1)(ii) for purposes of determining whether such antennas qualify for routine processing, as long as such

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66 *See* SIA Proposed Revisions §25.209(g)(1)(i).

antennas meet those standards at 2 degrees and beyond in the geostationary satellite orbital plane.[67]

Antennas operating in the 12 GHz band that meet the antenna performance standards starting at 2 degrees off-axis are fully consistent with the Commission's two-degree spacing requirement and, thus, should be routinely licensed. For example, a transmit/receive earth station antenna with a dimension less than 1.2 meters in the geostationary satellite orbital plane that meets the antenna performance standards beginning at 1.5 degrees off-axis in the 14 GHz band and at 1.8 degrees off-axis in the 12 GHz band would be routinely processed and would receive an ALSAT designation.

While the SIA proposes to modify the antenna performance standards for purposes of routine processing, the SIA believes that receive protection should remain consistent with the current standards. Thus, the SIA proposes to modify Section 25.209(c) of the Commission's Rules by starting the reference pattern at 1.25 degrees for antennas in the 12 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane.[68] This modification would be consistent with the present reference pattern, as provided in the current Section 25.209(g) of the Commission's Rules, for purposes of receive protection.[69]

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67 *See* SIA Proposed Revisions §25.209(g)(2). The SIA determined that modifying the Section 25.209 pattern for receive antennas might impact the scope of the protection required. Thus, the SIA proposes to allow routine processing of receive antennas as long as the antenna meets the antenna performance standards at 2 degrees and beyond. For purposes of determining receive protection, as opposed to routine processing, protection will be provided for these antennas to the extent defined in the SIA's proposed §25.209(c).

68 *See* SIA Proposed Revisions §25.209(c).

69 *See* 47 C.F.R. §25.209(g). The SIA also proposes to modify the current reference patterns of Section 25.209(c) by replacing the –10 dBi value in the last equation in Section 25.209(a) with 0 dBi for off-axis angles greater than 85 degrees. *See* SIA Proposed Revisions §§25.209(c), 25.209(g)(1)(ii).

Consistent with the SIA's proposal to provide separate antenna performance standards for transmitting and receiving antennas, the SIA proposes to modify Section 25.209(e) of the Commission's Rules to separately specify the reference patterns applicable to each type of antenna.[70] The SIA also proposes to modify the Commission's proposed Section 25.209(f) to clarify that this section refers to transmitting antennas.[71]

E. Proposed Analog Video Transmissions

Section 25.211 establishes certain standards for analog video FSS transmissions. SIA has added the word "analog" to the title of the provision to clarify that it does not apply to digital transmissions, which are covered in Section 25.212.

Neither the Commission nor SIA has proposed changes to Sections 25.211(a)-(c).

SIA has revised the Commission's proposed wording of Section 25.211(d), which identifies the routine processing standards for full transponder services, to:

- clarify that the enumerated standards apply solely to analog video services, consistent with the original intent of the rule;
- clarify that the earth station dimensions shown relate solely to the portion of the antenna that is in the GSO plane (*e.g.*, if the applicant were proposing to use an elliptical antenna, the applicant's eligibility for routine processing would be based on the dimension of the antenna in the GSO plane, not the equivalent diameter of a circular antenna with the same reflector surface area); and
- exclude 6 GHz band antennas having dimensions greater than 9 meters and 14 GHz band antennas having dimensions greater than 5 meters in the GSO plane from routine processing. This exclusion will preserve the upper limit on antenna dimensions that

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70 *See* SIA Proposed Revisions § 25.209(e)(1), (e)(2).

exists in the present version of Section 25.211 for routine processing of 6 GHz and 14 GHz antennas.

SIA has revised the Commission's proposed wording of Section 25.211(e) to make the clarifying changes concerning analog video and dimensions in the GSO plane that are discussed above. SIA also has eliminated the reference to Section 25.220, which independently of Section 25.211 establishes the standards for non-conforming (C-band and Ku-band) operations.

SIA has revised the Commission's proposed wording of Section 25.211(f) to clarify that it, like the rest of Section 25.211, is limited to *analog* video transmissions.

F. Proposed Narrowband Analog Transmissions and Digital Transmissions

Section 25.212 establishes certain standards for FSS transmissions that are not analog video transmissions. SIA has modified the title of the provision to clarify that, consistent with the text of the rule, the only type of analog transmissions that the rule applies to are narrowband analog transmissions. SIA also has modified the title of the provision to clarify that, consistent with the text of the rule, all digital transmissions, narrowband and full transponder alike, are covered by the rule.

Neither the Commission nor SIA has proposed changes to Sections 25.212(a)-(b).

In the introductory clause to Section 25.212(c), SIA has added 12 GHz to the bands covered by (c), to highlight the inclusion of satellite downlink EIRP spectral density in the 12 GHz band.

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[71] *See* SIA Proposed Revisions § 25.209(f).

Consistent with proposed changes made elsewhere in the rules, SIA has modified Section 25.212(c)(i) to clarify that the input power density at issue is the input power *spectral* density into the antenna *flange*.

SIA has further revised Section 25.212(c)(i), which as proposed in the NPRM made eligibility for routine processing in the 14 GHz band turn on whether the earth station diameter was at least 1.2 meters. Under the revised version SIA is proposing, which SIA believes is consistent with the structure proposed in the NPRM, 14 GHz band earth stations would be eligible for routine processing so long as they satisfied the requirements of paragraph (a) or (g) and paragraph (b) of Section 25.209. For example, even if an antenna had a dimension less than 1.2 meters in the GSO plane, it would be eligible for routine processing on an ALSAT basis if it satisfied the 29-25 log theta standard beginning at 1.5 degrees.

SIA has added Section 25.212(c)(ii) addressing the standards for routine processing of digital transmissions in the 14 GHz band. For this purpose, SIA proposes to use the same maximum input power spectral density that the Commission, in Section 25.134(a), has proposed for digital VSAT systems (*i.e.*, -14 – 10log(N)dB(W/4kHz)). SIA also proposes to set the maximum power into the antenna flange for this purpose, for full transponder digital video service using antennas with dimensions in the GSO plane of 1.2-5 meters, at 27 dBW, the same figure used in Section 25.211(d)(2) for analog video transmissions, and the figure SIA believes has become in practice the industry standard for full transponder digital video transmissions. Finally, consistent with the changes SIA is suggesting in Sections 25.134(a)(3) and (a)(4), SIA proposes to use a maximum transmitted satellite carrier EIRP spectral density for this purpose of 9 dBW/4 kHz, with the possibility of increasing this figure up to a maximum of 13 dBW/4 kHz if coordinated with adjacent satellite operators.

SIA has deleted the first sentence of Section 25.212(d) as proposed in the NPRM. The sentence appears in the present version of the rule, but the new version of the rule supersedes it. SIA assumes that the Commission intended to delete this sentence.

SIA also has deleted the second sentence of Section 25.212(d) as proposed in the NPRM, dealing with which 14 GHz band antennas are subject to Section 25.220 procedures, because Section 25.212(c) already addresses this issue.

Consistent with proposed changes made elsewhere in the rules, SIA has modified Section 25.212(d) to classify antennas in terms of dimensions within the GSO plane, rather than diameter, and to clarify that the power spectral density at issue is the *input* power spectral density into the antenna *flange*.

SIA has eliminated the words "narrowband and/or wideband" appearing before the term "digital" in Section 25.212(d). Those words are unnecessary, because all digital signals are either narrowband or wideband.

SIA also has eliminated the term "SCPC" in Section 25.212(d) when used to refer to digital services. Digital transmissions that have the same power spectral density have the same interference potential, regardless of whether they are SCPC or MCPC, so there is no reason to distinguish between the two for purposes of Section 25.212(d) digital services.

Consistent with SIA's proposal in Section 25.134(a), SIA has deleted the portions of Section 25.212 specifying a value of "N=2" for Aloha multiple access techniques. It is industry's view that this formula could jeopardize the viability of Aloha techniques, and that the small possibility of "collisions" associated with the use of Aloha techniques is an acceptable tradeoff for gaining the benefits associated with such techniques.

SIA has added a sentence to the end of Section 25.212(d) clarifying that 6 GHz band antennas having dimensions less than 4.5 meters in the GSO plane are not eligible for routine processing, and instead are subject to Section 25.220 procedures.

SIA has modified Section 25.212(e) to clarify that narrowband analog transmissions and all digital transmissions proposing to use transmitted satellite carrier EIRP densities and/or maximum antenna input power densities in excess of those specified in Sections 25.212(c) or (d) are subject to Section 25.220 procedures.

G. Applying Power Limits to Other Bands

The Commission proposed new rule sections (§25.211(g) and §25.212(f)) specifying that it could apply the power limits appearing in §25.211 or §25.212 to earth stations applying to operate in other FSS frequency bands. SIA considers that the unique circumstances of each frequency band warrant exploration and identification, through an open rulemaking proceeding, of the appropriate technical rules for each band. Currently, §25.211 and §25.212 apply to the traditional C and Ku- band frequencies (e.g., 3700-4200 MHz/5925-6425 MHz and 11.7-12.2 GHz/14.0-14.5 GHz). The types of systems planned for each frequency band, even immediately adjacent frequency bands, can be vastly different. For instance, broadcasting-satellite service systems in the 12.2-12.7 GHz band, which are immediately adjacent to the fixed-satellite service band at 11.7-12.2 GHz, operate under very different technical rules. The orbital separation enjoyed by BSS systems is 9 degrees, vs. the 2 degree spacing for FSS. The greater orbit spacing allows the use of smaller antennas in the 12.2-12.7 GHz band, thus necessitating a higher power. Furthermore, some frequency bands may be used for specific applications, e.g., only feeder links, or TT&C sub-systems. In the case of TT&C links, for instance, the power requirements for these links are generally high due to the levels of reliability required.

Considering these types of variations between even adjacent frequency bands, SIA proposes to delete §25.211(g) and §25.212(f). The Commission should consider each frequency band separately, instead of applying the limits from adjacent or nearby frequency bands.

H. Proposed Definitions

Section 25.201, as it appeared in the NPRM, provided definitions for "full transponder," "narrowband," and "wideband."

SIA has revised the definition of "full transponder" to clarify that transmissions using all of a transponder's power are full transponder services, even if they occupy less than the full bandwidth of the transponder. SIA also has clarified that transmissions using all of a transponder's bandwidth are full transponder services, even if they do not use all of the transponder's power (*e.g.*, CDMA services).

SIA has eliminated the definition of "narrowband," because whenever that term is used in Section 25.212, it also is defined there.

SIA also has eliminated the definition of "wideband," because the changes that SIA has proposed to Section 25.212 make the definition unnecessary.

I. Non-Conforming Transmit Earth Station Operations in the C and Ku Bands

Section 25.220 establishes procedures for non-routine processing of non-conforming earth stations.

SIA has revised Section 25.220(a)(1) to limit the applicability of Section 25.220 to C-band and Ku-band antennas and to make clear that Section 25.220 does not apply to the Ka band. SIA takes no position concerning the extent to which Section 25.220 could be applied in the future to other bands, but does not believe there is an adequate record in this proceeding to apply it to bands other than the C-band and the Ku-band.

SIA also has revised Section 25.220(a)(1) to limit the applicability of Section 25.220 to the transmit portion of antennas. SIA sees no need to have special processing procedures for receive antennas that do not conform to the 29-25 log theta standard. SIA proposes instead that non-conforming receive antennas be eligible for routine processing to the extent they satisfy the standards set forth in SIA's proposed Section 25.209(g)(2), as long as the level of interference protection to which these antennas are entitled is as specified in SIA's proposed Section 25.209(c).

Once receive antennas are eliminated from Section 25.220, there is no need to have separate provisions addressing transmit-only antennas and transmit/receive antennas. So SIA has condensed these provisions.

SIA has added clarifying language, which should be self-explanatory, in Section 25.220(b).

SIA has revised Section 25.220(c) to limit the circumstances in which power can be reduced to compensate for an antenna pattern that does not satisfy the 29-25 log theta standard. As revised, compensating in this fashion would be permitted only in the 6 GHz band, and only if coordinated with adjacent satellite operators. SIA does not believe that power reductions should be permitted without coordination, as proposed in the NPRM. SIA fears that permitting power reductions more generally would encourage substandard antennas to proliferate, and would blur the distinction between conforming and non-conforming antennas.

SIA has revised the affidavit procedure the Commission has proposed in Section 25.220(d) to require that the satellite operator furnish statements from the adjacent satellite operators with whom it has coordinated, rather than simply certifying that the proposed operations are consistent with the coordination agreements it has entered into with the adjacent

satellite operators. SIA considers it important that the adjacent satellite operators be contacted each time non-conforming operations are proposed, so that the adjacent operators can make their own assessments, before the FCC authorizes the non-conforming operations, as to whether the proposed operations are consistent with the parties' coordination agreements. Although this procedure may impose an additional burden on the adjacent operators, it is a burden they consider to be necessary. SIA also notes that, with its proposed liberalization in Section 25.209(g) of the starting angle for small antennas eligible for routine processing, there should be far fewer antennas that will be subject to the affidavit procedures of Section 25.220(d).

J. Proposed Verification of Earth Station Antenna Performance Standards

In §25.132, the Commission proposed to remove the restriction in subsection (a) to the C and Ku-bands, in order to require verification of the antenna performance of earth stations operating in any frequency band. In reviewing this proposal, SIA found that §25.138 already specifies the antenna performance measurements for earth stations operating in the 20/30 GHz band.[72] In §25.138, the measurements required are specified somewhat differently (e.g., for the azimuth pattern, the close-in angular breakpoint in §25.138(d)(1)(i) is 10 degrees, while the equivalent breakpoint is 7 degrees in §25.132(b)(1)(i)(A)). More importantly, §25.138 regulates the off-axis eirp density of Ka-band earth stations, instead of separately regulating specific levels for the input power and earth station antenna pattern. Specifying only the off-axis eirp density for Ka-band earth stations allows operators to make trade-offs between power and antenna

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[72] It should also be noted that §25.115(e) applies the measurement requirements of §25.138 to all earth station filings in the 20/30 GHz bands (i.e., including individual earth stations).

performance. As such, it would not be appropriate to impose the antenna performance standard of §25.209 on measurements for Ka-band earth station antennas; rather, it would be more appropriate to provide comparisons of off-axis eirp density levels with the limits in §25.138. Accordingly, SIA proposes to exclude earth stations operating in the 20/30 GHz band from subsection (a) of §25.132 and to include a reference to the required Ka-band antenna performance measurements in §25.138 in new subsection (b)(3).

In §25.132(b)(1) and (b)(2), SIA proposes to insert the phrases "of a C or Ku band antenna" and "in the C or Ku band" respectively, to clarify that these subsections are specific to the C and Ku-bands and are not applicable to the Ka-band.[73] In addition, because of the addition of a new subsection (g) to §25.209, it is also necessary, when §25.209(a) is referred to in §25.132(b)(1) and (b)(2), to also include "or §25.209(g)." As described in greater detail earlier in this filing, §25.209(g) modifies the antenna performance standards for small antennas operating in specific frequency bands to take into account the physical characteristics of these smaller antennas. Therefore, when referring to §25.209(a) throughout other sections of Part 25, it is often necessary to specify §25.209(g) as well. The other modifications proposed by SIA in §25.132 are editorial.

K. Other Matters Regarding VSAT Licensing in the 12/14 GHz Band

In the NPRM, the Commission's proposed section 25.134(a) refers to a hub EIRP limit of 78.3 dBW without further description of the number of carriers.[74] The SIA believes that this proposal should be clarified to indicate that the maximum input power spectral density of the

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73 Consistent with the proposed changes to subsections (b)(1) and (b)(2), SIA also proposes to add the phrase "in the C or Ku band" to subsection (d).

74 NPRM, app. B, §25.134(a)(3).

hub earth station may not exceed –14-10log(N)dB(W/4kHz) for all transmissions and for all methods of multiple access techniques.[75]

Section 25.134(c) of the Commission's Rules currently provides that licensees authorized to operate in excess of certain power levels shall reduce their power levels if no good faith agreement can be reached with a future compliant licensee.[76] The SIA recommends deleting Section 25.134(c) because the substance of this provision is set forth in both the Commission's and the SIA's proposed Section 25.220 which provides that "if no good faith agreement can be reached between the satellite operator and the operator of a future 2 degree compliant satellite, the earth station operator shall reduce its power to those levels that would accommodate the 2 degree compliant satellite."[77] To avoid any confusion regarding differing language, the SIA believes that provisions regarding non-compliant antennas are more appropriately set forth in Section 25.220.

The Commission proposes in Section 25.134(d) that a VSAT licensee must follow the procedures proposed in Section 25.121(e)(3) in renewing its license.[78] In Section 25.121(e)(3), the Commission proposes that if a VSAT licensee does not bring all its licensed VSAT units into operation by the time of renewal, subsequent modification applications to add VSAT units will require prior authorization by the Commission.[79] In its Reply Comments in this proceeding, the SIA urged the Commission to abandon this proposal because it is impractical,

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75 *See* SIA Proposed Revisions §25.134(a)(5).

76 47 C.F.R. §25.134(c).

77 NPRM, app. B, §25.220(e)(2); *see also* SIA Proposed Revisions §25.220(d)(2).

78 NPRM, app. B, §25.134(d).

79 NPRM, app. B, §25.121(e)(3).

will increase the burden on both VSAT operators and the Commission's staff, and could delay the availability of services to new customers.[80]

As the SIA noted in its Reply Comments, VSAT operators are in the process of launching new, satellite-based Internet access systems for consumers and small businesses which depend on the installation of large numbers of sub-meter satellite earth stations. Thus, VSAT operators require authority to deploy a relatively large number of VSAT terminals to provide service to new customers within a few days of receiving an order for service. In this environment, market demand directly controls the number of VSAT units. Automatically limiting the number of authorized VSATs to those already in operation would seriously impair the operator's ability to grow its business after renewal. The Commission's proposal would require the submission of unnecessarily duplicative applications to recover authority that had already been granted and would result in adverse business implications that are not justified by any regulatory considerations.[81]

As the SIA previously stated, the very purpose of the Commission's blanket licensing policy is to permit flexibility and system growth, to reduce administrative overhead for both the Commission and the licensee, and to prevent regulatory delays. Limiting renewals to the number of installed VSATs would defeat the main purpose of the policy and restrict the flexibility it has brought to licensees.[82] Thus, consistent with the SIA's position on this matter, the SIA proposes that the reference to Section 25.121(e)(3) should be deleted from Section 25.134.[83]

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80 SIA Reply Comments at 16.

81 *Id.*

82 SIA Reply Comments at 16-17.

83 *See* SIA Proposed Revisions §25.134(c).

Conclusion

The views expressed in these Supplemental Comments represent consensus of the satellite industry regarding the technical modifications necessary to streamline the Part 25 rules. The SIA respectfully requests that the Commission revise Part 25 of its rules as proposed in these Comments.

Appendix

11/01/2001
Final Version

Proposed Revisions of the Satellite Industry Association
Part 25 Streamlining Proceeding
IB Docket No. 00-248

For the convenience of the reader, the text of the current Commission rule appears below in plain text. Additional text proposed by the Commission in the NPRM appears in bold type, and text proposed by the Commission to be deleted in the NPRM appears with a single strikethrough.

Proposed SIA additions appear in italics and proposed SIA deletions appear with a double strikethrough.

§25.132 Verification of earth station antenna performance standards.

(a) All applications for transmitting earth stations, *except for earth stations operating in the 20/30 GHz band,* ~~in the C and Ku bands~~ must be accompanied by a certificate pursuant to §2.902 of this chapter from the manufacturer of each antenna that the results of a series of radiation pattern tests performed on representative equipment in representative configurations by the manufacturer which demonstrates that the equipment complies with the performance standards set forth in §25.209. The licensee must be prepared to demonstrate the measurements to the Commission on request ~~in the course of an investigation of a harmful interference incident~~.

(b)(1) In order to demonstrate compliance *of a C or Ku band antenna* with §25.209(a) *or (g)* and *§25.209*(b), the following measurements on a production antenna performed on calibrated antenna range, as a minimum, shall be made at the bottom, middle and top of each allocated frequency band and submitted to the Commission:

(i) Co-polariz*ation*~~ed~~ patterns for each of two orthogonal senses of polarizations in two orthogonal cuts of the antenna.

(A) In the azimuth plane, plus and minus 7 degrees and plus and minus 180 degrees.

(B) In the elevation plane, zero to forty-five degrees.

(ii) Cross-polarization patterns in the E- and H- planes, plus and minus 9 degrees.

(iii) Main beam gain.

~~(2)~~ *(iv)* The FCC envelope specified in §25.209 shall be superimposed on each pattern. The minimum tests specified above are recognized as representative of the performance of the antenna in most planes although some increase in sidelobe levels should be expected in the spar planes and orthogonal spar planes.

(2)~~(3)~~ **Applicants seeking authority to use an antenna** *in the C or Ku band* **that does not meet the standards set forth in Section~~s~~ 25.209(a)** *or (g)* **and** *Section 25.209***(b) of this Chapter, pursuant to the procedure set forth in Section 25.220 of this Chapter, are required to submit a copy of the manufacturer's range test plots of the antenna gain patterns specified in paragraph (b)(1) of this section**.

(3) For earth station antennas in the 20/30 GHz band, the measurements specified in §§25.138(d) and (e) shall be performed.

(c) The tests specified in paragraph (b) of this section are normally performed at the manufacturer's facility; but for those antennas that are very large and only assembled on-site, on-site measurements may be used for product qualification data. If on-site data is to be used for qualification, the test frequencies and number of patterns should follow, where possible, the recommendations in paragraph (b) of this section, and the test data is to be submitted in the same manner as described in paragraph (a) of this section.

(d) For each new or modified transmitting antenna over 3 meters in diameter *in the C or Ku band*, the following on-site verification measurements must be completed at one frequency on an available transponder in each frequency band of interest and submitted to the Commission.

(1) Co-polariz*ation*~~ed~~ patterns in the elevation plane, plus and minus 7 degrees, in the transmit band.

(2) Co-polariz*ation*~~ed~~ patterns in the azimuth and elevation planes, plus and minus 7 degrees, in the receive band.

(3) System cross-polarization discrimination on-axis. The FCC envelope specified in §25.209 shall be superimposed on each pattern. The transmit patterns are to be measured with the aid of a co-operating earth station in coordination with the satellite system control center under the provisions of §25.272.

(e) Certification that the tests required by paragraph (c) of this section have been satisfactorily performed shall be provided to the Commission in notification that construction of the facilities has been completed as required by §25.133.

(f) Antennas less than 3 meters in diameter and antennas on simple (manual) drive mounts that are operated at a fixed site are exempt from the requirements of paragraphs (c) and (d) of this section provided that a detailed technical showing is made that confirms proper installation, pointing procedures, and polarization alignment and manufacturing quality control. These showings must also include a plan for periodic testing and field installation procedures and precautions.

(g) Records of the results of the tests required by this section must be maintained at the antenna site or the earth station operator's control center and be available for inspection.

§25.134 Licensing provisions of very small aperture terminal (VSAT) networks *in the 12/14 GHz band*.

~~(a) All applications for digital VSAT networks with a maximum outbound downlink EIRP density of +6.0 dBW/4 kHz per carrier and earth station antennas with maximum input power density of -14 dBW/4 kHz and maximum hub EIRP of 78.3 dBW will be processed routinely. All applications for analog VSAT networks with maximum outbound downlink power densities of +13.0 dBW/4 kHz per carrier and maximum antenna input power densities of -8.0 dBW/4 kHz shall be processed routinely in accordance with Declaratory Order in the Matter of Routine Licensing of Earth Stations in the 6 GHz and 14 GHz Bands Using Antennas Less Than 9 Meters and 5 Meters in Diameter, Respectively, for Both Full Transponder and Narrowband Transmissions, 2 FCC Rcd 2149 (1987) (Declaratory Order).~~

~~(b) Each applicant for digital and/or analog VSAT network authorization proposing to use transmitted satellite carrier EIRP densities in excess of +6.0 dBW/4 kHz and +13.0 dBW/4 kHz, respectively, and/or maximum antenna input power densities of -14.0 dBW/4 kHz and maximum hub EIRPs of 78.3 dBW and -8.0 dBW/ 4 kHz per carrier, respectively, shall conduct an engineering analysis using the Sharp, Adjacent Satellite Interference Analysis (ASIA) program. Applicants shall submit a complete description of those baseline parameters they use in conducting their analysis and tabular summaries of the ASIA program's output detailing potential interference shortfalls. Applicants shall also submit a narrative summary which must indicate whether there are margin shortfalls in any of the current baseline services as a result of the addition of the new applicant's high power service, and if so, how the applicant intends to resolve those margin shortfalls. Applicants shall submit link budget analyses of the operations proposed along with a detailed written explanation of how each uplink and each transmitted satellite carrier density figure is derived. Applicants shall provide proof by affidavit that all potentially affected parties acknowledge and do not object to the use of the applicant's higher power density.~~

(a) All applications for VSAT service in the 12/14 GHz band that meet the following requirements will be routinely processed:

(1) *If t***he maximum ~~transmitter~~** *input* **power spectral density of a digital modulated carrier into any GSO FSS earth station antenna** *does* **~~shall~~ not exceed - 14.0** *+ X* **- 10log(N) dB(W/4 kHz).** *For antennas with dimensions less than 1.8 meters in the geostationary orbital plane, X is a value from 0 dB to 2 dB, and the use of this maximum input power spectral density shall be associated with the antenna patterns in paragraph (a)(2) of this section. For antennas with dimensions of 1.8 meters in the geostationary satellite orbital plane, X is equal to zero, and the use of this maximum input power spectral density shall be associated with the antenna patterns in paragraphs (a), (b) and (g)(1)(ii) of Section 25.209. For antennas with dimensions greater than 1.8 meters in the geostationary orbital plane, X is equal to zero, and the use of this maximum input power*

spectral density shall be associated with the antenna patterns in paragraphs (a) and (b) of Section 25.209.

(i) For a VSAT network using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one.

(ii) For a VSAT network using code division multiple access (CDMA) technique, N is the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

~~**(iii) For a VSAT network using contention Aloha multiple access technique, N is equal to two.**~~

~~**(iv) For a VSAT network using contention CDMA/Aloha multiple access technique, N is twice the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam without contention.**~~

(2) *If the gain of any antenna having a dimension less than 1.8 meters to be employed in transmission associated with paragraph (a)(1) of this section from an earth station in the 14 GHz GSO/FSS shall lie below the envelope defined below*:

(i) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

(29-X) –25logθ	*dBi*	*Y° ≤ θ ≤ 7°*
(+8-X)	*dBi*	*7°< θ ≤ 9.2°*
(32-X) –25logθ	*dBi*	*9.2°< θ ≤ 48°*
(-10-X)	*dBi*	*48°< θ ≤ 85°*
0	*dBi*	*85°< θ ≤ 180°*

where X is defined in paragraph (a)(1) above.

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above for θ between Y and 7.0 degrees. For θ greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the gain envelope given above by more than 3 dB.

where Y is defined as follows:

For antennas with dimensions from 1.2 to less than 1.8 meters in the geostationary satellite orbital plane, Y=1.25.

For antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane, Y= 1.5.

(ii) In all other directions, the gain of the antenna shall lie below the envelope defined by:

(32-X)-25logθ	*dBi*	*Z°$\leq\theta\leq$48°*
(-10-X)	*dBi*	*48°$<\theta\leq$85°*
0	*dBi*	*85°$<\theta\leq$180°*

where X is defined in paragraph (a)(1) above, and θ and dBi are defined in paragraph (a)(2)(i) above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6 dB.

where Z is defined as follows:

For antennas with the smallest dimension of the aperture greater than or equal to 1.2 meters, Z=1.

For antennas with the smallest dimension of the aperture less than 1.2 meters, Z=3.

(iii) The off-axis cross-polarization of the antenna shall not exceed the envelope defined below:

(19-X)-25logθ	*dBi*	*1.8°$<\theta\leq$7°*
(-2-X)	*dBi*	*7°$<\theta\leq$9.2°*

where X is defined in paragraph (a)(1) above, and θ and dBi are defined in paragraph (a)(2)(i) above.

(iv) All applications for transmitting earth stations in the 14 GHz band that seek to employ a maximum input power spectral density into the antenna flange specified in paragraph (a)(1) of this section where X is greater than zero and where N is defined in paragraph (a)(1) of this section, must be accompanied by a certificate pursuant to §2.902 of this chapter from the manufacturer of each antenna that the results of a series of radiation pattern tests performed on

representative equipment in representative configuration by the manufacturer demonstrate that the equipment complies with the performance standards set forth in paragraphs (a)(2)(i) to (a)(2)(iii) of this section. The verification format of earth station antenna performance standards is given in §25.132.

(v) For antennas with dimensions less than 1.2 meters in the geostationary orbital plane and compliant with Section 25.209(g) starting between 1.5 and 1.8 degrees instead of 1 degree as stipulated in paragraph (a) of Section 25.209, X equals zero for transmissions associated with paragraph (a)(1) of this Section 25.134.

(*3*) *If t***he maximum GSO FSS satellite EIRP spectral density of the digital modulated emission** *of any transmission* ~~**shall**~~ *does* **not exceed** *9dB (W/4kHz)* ~~**6 dB (W/4kHz)**~~ **for all methods of modulation and accessing techniques.**

(4) If the maximum GSO FSS satellite EIRP spectral density of the digital modulated emission does not exceed 13dB (W/4kHz) for all methods of modulation and accessing techniques provided that the operator/licensee of the satellite(s) on which such VSAT applicant wishes to use such power level has successfully coordinated that power level with adjacent satellite operators.

(5) *If t***he maximum** *input power spectral density into the antenna flange* ~~**hub earth station EIRP**~~ *of the hub earth station supporting the VSAT network* ~~**shall**~~ *does* **not exceed** ~~**78.3 dBW**~~ *–14dBW/4kHz - 10log(N)* **for all methods of multiple access techniques** *where N is defined in paragraph (a)(1) of this section*~~**. and supporting VSAT network identified in paragraph (a)(1) of this section.**~~

(6) *If t*he maximum ~~transmitter~~ *input* power spectral density of an analog carrier into *the antenna flange of a*~~ny~~ GSO FSS earth station antenna ~~shall~~ *does* not exceed – 8.0 dB(W/4kHz) and the maximum GSO FSS satellite EIRP spectral density ~~shall~~ *does* not exceed + 13.0 dB(W/4kHz).

(b) Each applicant for digital and/or analog VSAT network authorization proposing to use *maximum input power spectral density at the antenna flange of the earth station or* **transmitted satellite carrier EIRP** *spectral* **densit***y*~~**ies and/or maximum antenna input power**~~ **in excess of those specified in paragraph (a) of this Section must comply with the procedures set forth in § 25.220 of this Chapter.**

~~(c) Licensees authorized pursuant to paragraph (b) of this section shall bear the burden of coordinating with any future applicants or licensees whose proposed compliant VSAT operations, as defined by paragraph (a) of this section, is potentially or actually adversely affected by the operation of the non-compliant licensee. If no good faith agreement can be reached, however, the non-compliant licensee shall reduce its power density levels to those compliant with *Section 25.212*. the VSAT Order or the Declaratory Order, whichever is applicable~~.

~~(d) An application for VSAT authorization shall be filed on FCC Form 312, Main Form and Schedule B. A VSAT licensee applying to renew its license must include on FCC Form 405, the number of constructed VSAT units in its network..~~

(c) **~~(d)~~ An application for VSAT authorization shall be filed on FCC Form 312, Main Form and Schedule B. ~~A VSAT licensee applying to renew its license must follow the procedures provided in § 25.121(e)(3) of this part.~~**

§25.201 Definitions

(**10**) **Full Transponder. Radio emissions or transmissions that occupy, or nearly occupy, the entire satellite transponder** *power and/or bandwidth.* ~~**C-band and Ku-band satellite systems typically have transponder bandwidths on the order of 36 MHz or more. Single carrier full transponder transmissions can include full motion analog video, thousands of multiplexed voice channels, or high data rates on the order of 50 Mb/s.**~~

~~**(18) Narrowband. Radio emissions or transmissions with narrow or limited spectral bandwidths. Narrowband satellite transmissions generally provide a single channel or a very limited number of channels. Narrowband satellite transmissions generally have bandwidths of 40 kHz to 5 MHz.**~~

~~**(41) Wideband. See Full Transponder.**~~

§25.209 Antenna performance standards.

(a) The gain of any antenna to be employed in transmission from an earth station in the geostationary satellite orbit fixed-satellite service (GSO FSS) shall lie below the envelope defined as follows:

(1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

29 - 25 log10 (Theta) dBi	1° </= Theta </= 7°
+8 dBi	7° < Theta </= 9.2°
32 - 25 log10 (Theta) dBi	9.2° < Theta </= 48°
-10 dBi	48° < Theta </= 180°

where Theta is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above for Theta between 1.0 and 7.0 degrees. For Theta greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the gain envelope given above by more than 3 dB.

(2) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

32 - 25 log10 (Theta) dBi	1° </= Theta </= 48°
-10 dBi	48° < Theta </= 180°

where Theta and dBi are defined above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(b) The off-axis cross-polarization gain of any antenna to be employed in transmission from an earth station to a space station in the domestic fixed-satellite service shall be defined by:

19 - 25 log10 (Theta) dBi	1.8° < Theta </= 7°
-2 dBi	7° < Theta </= 9.2°

(c) Earth station antennas licensed for reception of radio transmissions from a space station in the fixed-satellite service are protected from radio interference caused by other space

stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the reference~~d~~ patterns defined in paragraphs (a), ~~and~~ (b), *and (g)(1)(ii)* of this section*, except the reference pattern starts at 1.25 degrees instead of 1 degree as stipulated in paragraph (a) of this section for antennas in the 12 GHz band with dimensions of less than 1.8 meters in the geostationary satellite orbital plane,* and protected from radio interference caused by terrestrial radio transmitters identified by the frequency coordination process only to the degree to which harmful interference would not be expected to be caused to an earth station conforming to the reference pattern defined in paragraph (a)(2) of this section.

(d) ~~The patterns specified in paragraphs (a) and (b) of this section shall apply to all new earth station antennas initially authorized after February 15, 1985 and shall apply to all earth station antennas after March 11, 1994.~~ *The patterns specified in paragraph (a) or (g) and paragraph (b) of this section shall apply to all earth station antennas after [insert date of Commission's Report and Order].*

(e)*(1)* The operations of any *transmitting* earth station with an antenna not conforming to the standards of paragraph~~s~~ (a) *or (g)* and *paragraph* (b) of this section shall impose no limitations upon the operation, location or design of any terrestrial station, any other earth station, or any space station beyond those limitations that would be expected to be imposed by an earth station employing an antenna conforming to the reference patterns defined in paragraph~~s~~ (a) *or (g)* and *paragraph* (b) of this section.

(e)(2) The operations of any receiving earth station with an antenna not conforming to the standards of paragraphs (a), (b) and (g)(1)(ii) of this section shall impose no limitations upon the operation, location or design of any terrestrial station, any other earth station, or any space station beyond those limitations that would be expected to be imposed by an earth station employing an antenna conforming to the reference patterns defined in paragraphs (a), (b), and (g)(1)(ii) of this section, except the reference pattern starts at 1.25 degrees instead of 1 degree as stipulated in paragraph (a) of this section for antennas in the 12 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane.

~~(f) An earth station with an antenna not conforming to the standards of paragraphs (a) and (b) of this section will be routinely authorized after February 15, 1985 upon a finding by the Commission that unacceptable levels of interference will not be caused under conditions of uniform 2° orbital spacings. An earth station antenna initially authorized on or before February 15, 1985 will be authorized by the Commission to continue to operate as long as such operations are found not to cause any unacceptable levels of adjacent satellite interference. In either case, the Commission will impose appropriate terms and conditions in its authorization of such facilities and operations.~~

(f) An earth station with a~~n~~ ***transmitting*** **antenna not conforming to the standards of paragraph~~s~~ (a)** *or (g)* **and** *paragraph* **(b) of this section will be authorized ~~after~~**

~~February 15, 1985~~ **upon finding by the Commission that** *the antenna will not cause* **unacceptable levels of interference ~~will not be caused~~ under conditions of uniform 2º orbital spacing. An earth station antenna initially authorized on or before February 15, 1985 will be authorized by the Commission to continue to operate as long as such operations are found not to cause unacceptable levels of adjacent satellite interference. In either case, the Commission will impose appropriate terms and conditions in its authorization of such facilities and operations. The applicant has the burden of demonstrating that its** *transmitting* **antenna not conforming to the standards of paragraph~~s~~ (a)** *or (g)* **and** *paragraph* **(b) of this section will not cause unacceptable interference. This demonstration must comply with the procedures set forth in § 25.220 of this Chapter.**

~~(g) The antenna performance standards of small antennas operating in the 12/14 GHz band with diameters as small as 1.2 meters starts at 1.25° instead of 1° as stipulated in paragraph (a) of this section.~~

(g)*(1)(i) The antenna performance standards of small antennas operating in the 14 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane shall start as follows:*

for antennas with dimensions from 1.2 to less than 1.8 meters in the geostationary satellite orbital plane, at 1.25 degrees instead of 1 degree as stipulated in paragraph (a)(1) of this section, and in all other directions outside the main beam, at 3.0 degrees instead of 1 degree as stipulated in paragraph (a)(2) of this section,

for antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane, at 1.5 degrees instead of 1 degree as stipulated in paragraph (a)(1) of this section, and in all other directions outside the main beam, at 3.0 degrees instead of 1 degree as stipulated in paragraph (a)(2) of this section, and

for antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane not seeking ALSAT authorization, at up to 1.8 degrees instead of 1 degree as stipulated in paragraph (a)(1) of this section, provided that the satellite operator(s) of the satellite(s) with which the applicant is seeking authority to communicate has provided written confirmation from each of the adjacent satellite operators within 3 degrees that the antenna has been successfully coordinated.

(ii) *In frequency bands between 11.7 GHz and 30 GHz not shared on a co-primary basis with terrestrial services, the antenna gain envelope as it appears at the particular earth station for small aperture antennas with dimensions of 1.8 meters or less in the geostationary satellite orbital plane at angles from 85 to 180 degrees from the axis of the*

main lobe shall lie below 0 dBi instead of –10 dBi as stipulated in paragraph (a)(1) of this section.

(2) *Small antennas operating in the 12 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane shall be deemed to meet the receive antenna performance standards of Section 25.209(a) and (g)(1)(ii) for purposes of determining whether such antennas qualify for routine processing, as long as such antennas meet such standards starting at 2 degrees in the geostationary satellite orbital plane. For purposes of determining receive protection, as opposed to routine processing, protection will be provided for such antennas to the extent specified in Section 25.209(c).*

(h) The gain of any antennas to be employed in transmission from a gateway earth station antenna operating in the frequency bands 10.7-11.7 GHz, 12.75-13.15 GHz, 13.2125-13.25 GHz, 13.8-14.0 GHz, and 14.4-14.5 GHz and communicating with NGSO FSS satellites shall lie below the envelope defined below:

29 - 25log (θ) dBi	$1° \leq \theta < 36°$
-10 dBi	$36° \leq \theta \leq 180°$

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above.

§25.211: *Analog* Video ~~t~~ *T*ransmissions in the Fixed-Satellite Service.

(a) Downlink analog video transmissions in the band 3700-4200 MHz shall be transmitted only on a center frequency of 3700 + 20N MHz, where N=1 to 24. The corresponding uplink frequency shall be 2225 MHz higher.

(b) All 4/6 GHz analog video transmissions shall contain an energy dispersal signal at all times with a minimum peak-to-peak bandwidth set at whatever value is necessary to meet the power flux density limits specified in §25.208(a) and successfully coordinated internationally and accepted by adjacent U.S. satellite operators based on the use of state of the art space and earth station facilities. Further, all transmissions operating in frequency bands described in §25.208(b) and (c) shall also contain an energy dispersal signal at all times with a minimum peak-to-peak bandwidth set at whatever value is necessary to meet the power flux density limits specified in §25.208(b) and (c) and successfully coordinated internationally and accepted by adjacent U.S. satellite operators based on the use of state of the art space and earth station facilities. The transmission of an unmodulated carrier at a power level sufficient to saturate a transponder is prohibited, except by the space station licensee to determine transponder performance characteristics. All 12/14 GHz video transmissions for TV/FM shall identify the particular carrier frequencies for necessary coordination with adjacent U.S. satellite systems and affected satellite systems of other administrations.

(c) All initial analog video transmissions shall be preceded by a video test transmission at an uplink e.i.r.p. at least 10 dB below the normal operating level. The earth station operator shall not increase power until receiving notification from the satellite network control center that the frequency and polarization alignment are satisfactory pursuant to the procedures specified in §25.272. The stationary earth station operator that has successfully transmitted an initial video test signal to a satellite pursuant to this paragraph is not required to make subsequent video test transmissions if subsequent transmissions are conducted using exactly the same parameters as the initial transmission.

~~(d) In the 6 GHz band, an earth station with an equivalent diameter of 9 meters or smaller may be routinely licensed for transmission of full transponder services if the maximum power into the antenna does not exceed 450 watts (26.5 dBW). In the 14 GHz band, an earth station with an equivalent diameter of 5 meters or smaller may be routinely licensed for transmission of full transponder services if the maximum power into the antenna does not exceed 500 watts (27 dBW).~~

(d) An earth station may be routinely licensed for transmission ~~to~~ *of* full-transponder *analog video* **services provided:**

(1) **In the 6 GHz band, with an antenna ~~equivalent diameter~~** *dimension of* **4.5** *to 9* **meters ~~or greater~~** *in the geostationary satellite orbital plane*, **the maximum power into the antenna does not exceed 26.5 dBW; or**

(2) **In the 14 GHz band, with an antenna ~~equivalent diameter~~** *dimension of* **1.2** *to 5* **meters ~~or greater~~** *in the geostationary satellite orbital plane,* **the maximum power into the antenna does not exceed 27 dBW.**

(e) **Antennas with a~~n equivalent diameter~~** *dimension* **smaller than those specified in paragraph (d) of this section ~~are subject to the provisions of Section 25.220 of this Chapter, which may include power reduction requirements. These antennas~~ will not be routinely licensed for transmission of full transponder** *analog video* **services**.

(f) **Each applicant for authorization for** *analog* **video in the fixed-satellite service proposing to use transmitted satellite carrier EIRP densities, and/or maximum power into the antenna in excess of those specified in Section 25.211(d), must comply with the procedures set forth in § 25.220 of this Chapter.**

(g) ~~**The Commission has authority to apply the power level limits in this section to earth station applications for authority to operate in any other FSS frequency band to the extent it deems necessary to prevent unacceptable interference into adjacent satellite systems, to the extent that power limits have not been established elsewhere in this Part.**~~

§25.212 Narrowband *Analog* ~~t~~ *T*ransmissions *and Digital Transmissions* in the GSO Fixed-Satellite Service.

(a) Except as otherwise provided by these rules and regulations, criteria for unacceptable levels of interference caused by other satellite networks shall be established on the basis of nominal operating conditions and with the objective of minimizing orbital separations between satellites.

(b) Emissions with an occupied bandwidth of less than 2 MHz are not protected from interference from wider bandwidth transmissions if the r.f. carrier frequency of the narrowband signal is within ±1 MHz of one of the frequencies specified in §25.211(a).

(c) In the *12/*14 GHz band,

(i) an earth station *meeting the requirements of paragraph (a) or (g) and paragraph (b) of Section 25.209* ~~with an equivalent diameter of 1.2 meters or greater~~ may be routinely licensed *under this Section 25.212* for transmission of narrowband analog services with bandwidths up to 200 kHz if the maximum input power *spectral* density into the antenna *flange* does not exceed -8 dBW/4 kHz and the maximum transmitted satellite carrier EIRP *spectral* density does not exceed 13 dBW/4 kHz, ~~and~~

(ii) an earth station meeting the requirements of Section 25.209(a) or (g) and Section 25.209(b) may be routinely licensed under this Section 25.212 for transmission of digital services if the maximum input power spectral density into the antenna of the earth station does not exceed –14dBW/4kHz - 10log(N) where N is defined in Section 25.134(a)(1) of this Chapter, or in the case of full transponder digital video services, the maximum power into the antenna flange does not exceed 27 dBW for an antenna with a dimension of 1.2 meters to 5 meters in the geostationary orbital plane, and, either

(1) the maximum transmitted satellite carrier EIRP spectral density does not exceed 9dBW/4kHz, or

(2) the maximum transmitted satellite carrier EIRP spectral density does not exceed 13dBW/4kHz and provided that the operator/licensee of the satellite(s) on which the applicant wishes to use such power level has successfully coordinated that power level with adjacent satellite operators.

~~**Antennas with an equivalent diameter smaller than 1.2 meters**~~ *Earth stations* **in the 14 GHz band** *not meeting the applicable requirements of clause (i) or (ii)* **are subject to the provisions of §25.220 of this chapter**~~**, which may include power reduction requirements**~~**.**

~~(d)~~ **(1)** ~~In the 6 GHz band, an earth station with an equivalent diameter of 4.5 meters or greater may be routinely licensed for transmission of SCPC services if the maximum power densities into the antenna do not exceed +0.5 dBW/4 kHz for analog SCPC carriers with~~

~~bandwidths up to 200 kHz, and do not exceed -2.7 dBW/4 kHz for narrow and/or wideband digital SCPC carriers.~~ **~~Antennas with an equivalent diameter smaller than 1.2 meters in the 14 GHz band are subject to the provisions of §25.220 of this chapter, which may include power reduction requirements.~~**

(d) ~~**(2)**~~ **In the 6 GHz band, an earth station with an ~~equivalent diameter~~ antenna** *dimension* **of 4.5 meters or greater** *in the geostationary satellite orbital plane* **may be routinely licensed for transmission of SCPC services if the maximum** *input* **power spectral densities into the antenna** *flange* **do not exceed + 0.5 dB(W/4kHz) for analog SCPC carriers with bandwidths up to 200 kHz and do not exceed –2.7 – 10log(N) dB (W/4kHz) for ~~narrow and/or wideband~~ digital ~~SCPC~~ carriers.**

(i) For digital ~~SCPC~~ *transmissions* **using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one.**

(ii) For digital ~~SCPC~~ *transmissions* **using code division multiple access (CDMA) technique, N is the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.**

~~**(iii) For digital SCPC using contention Aloha multiple access technique, N is equal to two.**~~

~~**(iv) For digital SCPC using contention CDMA/Aloha multiple access technique, N is twice the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite-receiving beam without contention.**~~

In the 6 GHz band, antennas with a dimension smaller than 4.5 meters in the geostationary satellite orbital plane are subject to the provisions of §25.220 of this chapter.

(e) Each applicant for authorization for narrowband *analog transmissions and/or digital* **transmissions in the fixed-satellite service proposing to use transmitted satellite carrier EIRP densities, and/or maximum antenna input power densities in excess of those specified in paragraph (c) of this Section for Ku-band service, or paragraph (d) of this Section for C-band service, respectively, must comply with the procedures set forth in § 25.220 of this Chapter.**

(f) ~~**The Commission has authority to apply the power level limits in this section to earth station applications for authority to operate in any other FSS frequency band to the extent it deems necessary to prevent unacceptable interference into adjacent satellite systems, to the extent that power limits have not been established elsewhere in this Part.**~~

§ 25.220 Non-conforming transmit~~/receive~~ earth station operations *in the C and Ku bands***.**

(a)(1) This *S***ection** *25.220* **applies to earth station applications** *for antennas proposed to operate in the C band and/or Ku band* **in which:**

(i) the *transmit portion of the* **proposed antenna does not conform to the standards of §25.209(a)** *or (g)* **and** *§25.209***(b) of this Chapter, and/or**

(ii) the proposed *transmit* **power density levels are in excess of those specified in §25.134, §25.211, or §25.212 of this Chapter, or** *for antennas proposed to transmit in the 6 GHz band,* **those derived by the procedure set forth in paragraph (c)~~(1)~~ of this Section, whichever is applicable.**

Protection from interference will be provided for the receive portion of such antennas to the extent specified in Section 25.209(c), and routine processing for the receive portion of such antennas will be determined in accordance with Section 25.209(g)(2).

~~**(2) Paragraphs (b) through (c) of this section apply to the earth station applications described in paragraph (a)(1) of this section, in which the applicant seeks transmit/receive authority.**~~

~~**(3) Paragraph (f) of this section applies to the earth station applications described in paragraph (a)(1) of this section in which the applicant seeks transmit-only or receive-only authority.**~~

(2)~~**(4)**~~ **The requirements for petitions to deny applications filed pursuant to this section are set forth in Section 25.154 of this Chapter.**

(b) If ~~an~~ *the transmit portion of the* **antenna proposed for use by the applicant does not comply with the antenna performance standards contained in §25.209(a)** *or (g)* **and** *§25.209***(b), the applicant must provide, as an exhibit to its FCC Form 312 application, the antenna gain patterns specified in §25.132(b) of this Chapter.**

(c) If ~~an~~ *the transmit portion of the* **antenna proposed for use by the applicant** *in the 6 GHz band* **does not comply with the** *antenna* **performance standards contained in §25.209(a) and (b), the applicant must meet the requirements of either** *this* **paragraph (c)~~(1)~~ or** *paragraph (d)(1)* **~~(c)(2)~~ of this Section***, as applicable,* ~~**to obtain protection from receiving interference from adjacent satellite operators. The applicant must meet the requirements of either paragraph (c)(1) or (c)(3) of this Section**~~ **to obtain authority to transmit.**

The applicant must provide*:*

(i) **in its Form 312, Schedule B, the power and power density levels that result by reducing the values stated in §25.134, §25.211, or §25.212, whichever is applicable, by the number of decibels that the non-compliant antenna fails to meet the antenna performance standard*s* of §25.209(a) and (b),** *and* ~~**or**~~

(ii) *statement(s) that the operator(s) of the satellite(s) with which the applicant is seeking authority to communicate has obtained from the adjacent satellite operators within 3 degrees, indicating that the operation of the proposed antenna has been coordinated.*

~~**(2) The applicant will not receive protection from adjacent satellite interference from any satellite unless the applicant has provided the affidavits listed in paragraph (d)(1) of this Section from the operator of that satellite(s).**~~

~~**(3) The applicant will not be permitted to transmit to any satellite unless the applicant has provided the affidavits listed in paragraph (e)(1) of this Section from the operator of that satellite(s).**~~

~~**(d)(1) If an antenna proposed for use by the applicant does not comply with the performance standards contained in §25.209(a) and (b), the applicant must submit the affidavits listed in paragraphs (d)(1)(i) through (d)(1)(iv) of this Section to qualify for protection from receiving interference from other satellite systems. The applicant will be granted protection from receiving interference only with respect to the satellite systems included in the coordination agreements referred to in the affidavit required by paragraph (d)(1)(ii) of this section, and only to the extent that protection from receiving interference is afforded by those coordination agreements.**~~

~~**(i) a statement from the satellite operator acknowledging that the proposed operation of the subject non-conforming earth station with its satellite(s) has the potential to receive interference from adjacent satellite networks that may be unacceptable.**~~

~~**(ii) a statement from the satellite operator that it has coordinated the operation of the subject non-conforming earth station accessing its satellite(s), including its required downlink power density based on the information contained in the application, with all adjacent satellite networks within 6° of orbital separation from its satellite(s), and the operations will not violate any existing coordination agreement for its satellite(s) with other satellite systems.**~~

~~(iii) a statement from the satellite operator that it will include the subject non-conforming earth station operations in all future satellite network coordinations, and~~

~~(iv) a statement from the Earth station applicant certifying that it will comply with all coordination agreements reached by the satellite operator(s).~~

~~(2) A license granted pursuant to paragraph (d)(1) of this section will include, as a condition on that license, that if no good faith agreement can be reached between the satellite operator and the operator of a future 2° compliant satellite, the earth station operator shall accept the power density levels that would accommodate the 2° compliant satellite.~~

~~(c)~~ *(d)***(1)** *If the transmit portion of the antenna proposed for use by the* ~~An~~ **earth station applicant** *does not comply with the antenna performance standards contained in paragraph (a) or (g) and paragraph (b) of Section 25.209, and paragraph (c) of this section does not apply, and/or the antenna has* ~~proposing to use~~ **transmitted satellite carrier EIRP densities, and/or maximum** *input* **power** *spectral density* **into the antenna** *flange* **in excess of the levels in §25.134, §25.211, §25.212,** ~~or the power density levels derived through the procedure set forth in paragraph (c)(1) of this Section, whichever is applicable, shall provide~~ **the following** *statements* ~~affidavits~~ *shall be provided* **as an exhibit to** *the* ~~its~~ **earth station application:**

(i) a statement from the satellite operator acknowledging that the proposed operation of the subject non-conforming earth station with its satellite(s) has the potential to create interference to adjacent satellite networks that may be unacceptable.

(ii) ~~a~~ **statement***(s) that the operator(s) of the satellite(s) with which the applicant is seeking authority to communicate has obtained* **from the** *adjacent* **satellite operator***s within 6 degrees, indicating* **that** ~~it has coordinated~~ **the operation of the subject non-conforming Earth Station** *has been coordinated.* ~~accessing its satellite(s), and its corresponding downlink power density requirements (based on the information contained in the application) with all adjacent satellite networks within 6° of orbital separation from its satellite(s), and the operations will not violate any existing coordination agreement for its satellite(s) with other satellite systems.~~

(iii) a statement from the satellite operator that it will include the subject non-conforming Earth Station *operations with respect to the antenna performance standards referenced in paragraph (d)(1) of this section,* **power and power densities in all future satellite network coordinations, and**

(iv) a statement from the Earth Station applicant certifying that it will comply with all coordination agreements reached by the satellite operator(s).

(2) A license granted pursuant to paragraph ~~(c)~~ *(d)*(1) of this section will include, as a condition on that license, that if no good faith agreement can be reached between the satellite operator and the operator of a future 2° compliant satellite, the earth station operator shall reduce its power to those levels that would accommodate the 2° compliant satellite.

~~**(f)(1) If an earth station applicant requests transmit-only authority, and its proposed antenna does not conform to the standards of §25.209(a) and (b) of this Chapter, it must meet the requirements of paragraphs (b) and (c) of this section.**~~

~~**(2) If an earth station applicant requests transmit-only authority, and its proposed power density levels are in excess of those specified in §25.134, §25.211, or §25.212 of this Chapter, or those derived by the procedure set forth in paragraph (c)(1) of this section, it must meet the requirements of paragraph (c) of this section.**~~

~~**(3) If an earth station applicant requests receive-only authority, and its proposed antenna does not conform to the standards of §25.209(a) and (b) of this Chapter, it must meet the requirements of paragraphs (b) and (d) of this section.**~~

Proposed Revisions of the Satellite Industry Association
Part 25 Streamlining Proceeding
IB Docket No. 00-248

§25.132 Verification of earth station antenna performance standards.

(a) All applications for transmitting earth stations, except for earth stations operating in the 20/30 GHz band, must be accompanied by a certificate pursuant to §2.902 of this chapter from the manufacturer of each antenna that the results of a series of radiation pattern tests performed on representative equipment in representative configurations by the manufacturer which demonstrates that the equipment complies with the performance standards set forth in §25.209. The licensee must be prepared to demonstrate the measurements to the Commission on request.

(b)(1) In order to demonstrate compliance of a C or Ku band antenna with §25.209(a) or (g) and §25.209(b), the following measurements on a production antenna performed on calibrated antenna range, as a minimum, shall be made at the bottom, middle and top of each allocated frequency band and submitted to the Commission:

(i) Co-polarization patterns for each of two orthogonal senses of polarizations in two orthogonal cuts of the antenna.

(A) In the azimuth plane, plus and minus 7 degrees and plus and minus 180 degrees.

(B) In the elevation plane, zero to forty-five degrees.

(ii) Cross-polarization patterns in the E- and H- planes, plus and minus 9 degrees.

(iii) Main beam gain.

(iv) The FCC envelope specified in §25.209 shall be superimposed on each pattern. The minimum tests specified above are recognized as representative of the performance of the antenna in most planes although some increase in sidelobe levels should be expected in the spar planes and orthogonal spar planes.

(2) Applicants seeking authority to use an antenna in the C or Ku band that does not meet the standards set forth in Section 25.209(a) or (g) and Section 25.209(b) of this Chapter, pursuant to the procedure set forth in Section 25.220 of this Chapter, are required to submit a copy of the manufacturer's range test plots of the antenna gain patterns specified in paragraph (b)(1) of this section.

(3) For earth station antennas in the 20/30 GHz band, the measurements specified in §§25.138(d) and (e) shall be performed.

(c) The tests specified in paragraph (b) of this section are normally performed at the manufacturer's facility; but for those antennas that are very large and only assembled on-site, on-site measurements may be used for product qualification data. If on-site data is to be used for qualification, the test frequencies and number of patterns should follow, where possible, the recommendations in paragraph (b) of this section, and the test data is to be submitted in the same manner as described in paragraph (a) of this section.

(d) For each new or modified transmitting antenna over 3 meters in diameter in the C or Ku band, the following on-site verification measurements must be completed at one frequency on an available transponder in each frequency band of interest and submitted to the Commission.

(1) Co-polarization patterns in the elevation plane, plus and minus 7 degrees, in the transmit band.

(2) Co-polarization patterns in the azimuth and elevation planes, plus and minus 7 degrees, in the receive band.

(3) System cross-polarization discrimination on-axis. The FCC envelope specified in §25.209 shall be superimposed on each pattern. The transmit patterns are to be measured with the aid of a co-operating earth station in coordination with the satellite system control center under the provisions of §25.272.

(e) Certification that the tests required by paragraph (c) of this section have been satisfactorily performed shall be provided to the Commission in notification that construction of the facilities has been completed as required by §25.133.

(f) Antennas less than 3 meters in diameter and antennas on simple (manual) drive mounts that are operated at a fixed site are exempt from the requirements of paragraphs (c) and (d) of this section provided that a detailed technical showing is made that confirms proper installation, pointing procedures, and polarization alignment and manufacturing quality control. These showings must also include a plan for periodic testing and field installation procedures and precautions.

(g) Records of the results of the tests required by this section must be maintained at the antenna site or the earth station operator's control center and be available for inspection.

§25.134 Licensing provisions of very small aperture terminal (VSAT) networks in the 12/14 GHz band.

(a) All applications for VSAT service in the 12/14 GHz band that meet the following requirements will be routinely processed:

(1) If the maximum input power spectral density of a digital modulated carrier into any GSO FSS earth station antenna does not exceed - 14.0 + X - 10log(N) dB(W/4 kHz). For antennas with dimensions less than 1.8 meters in the geostationary orbital plane, X is a value from 0 dB to 2 dB, and the use of this maximum input power spectral density shall be associated with the antenna patterns in paragraph (a)(2) of this section. For antennas with dimensions of 1.8 meters in the geostationary satellite orbital plane, X is equal to zero, and the use of this maximum input power spectral density shall be associated with the antenna patterns in paragraphs (a), (b) and (g)(1)(ii) of Section 25.209. For antennas with dimensions greater than 1.8 meters in the geostationary orbital plane, X is equal to zero, and the use of this maximum input power spectral density shall be associated with the antenna patterns in paragraphs (a) and (b) of Section 25.209.

(i) For a VSAT network using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one.

(ii) For a VSAT network using code division multiple access (CDMA) technique, N is the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

(2) If the gain of any antenna having a dimension less than 1.8 meters to be employed in transmission associated with paragraph (a)(1) of this section from an earth station in the 14 GHz GSO/FSS shall lie below the envelope defined below:

(i) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

$(29-X) -25\log\theta$	dBi	$Y° \le \theta \le 7°$
$(+8-X)$	dBi	$7° < \theta \le 9.2°$
$(32-X) -25\log\theta$	dBi	$9.2° < \theta \le 48°$
$(-10-X)$	dBi	$48° < \theta \le 85°$
0	dBi	$85° < \theta \le 180°$

where X is defined in paragraph (a)(1) above.

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak

gain of an individual sidelobe may not exceed the envelope defined above for θ between Y and 7.0 degrees. For θ greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the gain envelope given above by more than 3 dB.

where Y is defined as follows:

For antennas with dimensions from 1.2 to less than 1.8 meters in the geostationary satellite orbital plane, Y=1.25.

For antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane, Y= 1.5.

(ii) In all other directions, the gain of the antenna shall lie below the envelope defined by:

(32-X)-25logθ	dBi	$Z° \leq \theta \leq 48°$
(-10-X)	dBi	$48° < \theta \leq 85°$
0	dBi	$85° < \theta \leq 180°$

where X is defined in paragraph (a)(1) above, and θ and dBi are defined in paragraph (a)(2)(i) above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6 dB.

where Z is defined as follows:

For antennas with the smallest dimension of the aperture greater than or equal to 1.2 meters, Z=1.

For antennas with the smallest dimension of the aperture less than 1.2 meters, Z=3.

(iii) The off-axis cross-polarization of the antenna shall not exceed the envelope defined below:

(19-X)-25logθ	dBi	$1.8° < \theta \leq 7°$
(-2-X)	dBi	$7° < \theta \leq 9.2°$

where X is defined in paragraph (a)(1) above, and θ and dBi are defined in paragraph (a)(2)(i) above.

(iv) All applications for transmitting earth stations in the 14 GHz band that seek to employ a maximum input power spectral density into the antenna flange specified in paragraph (a)(1) of this section where X is greater than zero and where N is defined in paragraph (a)(1) of this section, must be accompanied by a certificate pursuant to §2.902 of this chapter from the manufacturer of each antenna that the results of a series of radiation pattern tests performed on representative equipment in representative configuration by the manufacturer demonstrate that the equipment complies with the performance standards set forth in paragraphs (a)(2)(i) to (a)(2)(iii) of this section. The verification format of earth station antenna performance standards is given in §25.132.

(v) For antennas with dimensions less than 1.2 meters in the geostationary orbital plane and compliant with Section 25.209(g) starting between 1.5 and 1.8 degrees instead of 1 degree as stipulated in paragraph (a) of Section 25.209, X equals zero for transmissions associated with paragraph (a)(1) of this Section 25.134.

(3) If the maximum GSO FSS satellite EIRP spectral density of the digital modulated emission of any transmission does not exceed 9dB (W/4kHz) for all methods of modulation and accessing techniques.

(4) If the maximum GSO FSS satellite EIRP spectral density of the digital modulated emission does not exceed 13dB (W/4kHz) for all methods of modulation and accessing techniques provided that the operator/licensee of the satellite(s) on which such VSAT applicant wishes to use such power level has successfully coordinated that power level with adjacent satellite operators.

(5) If the maximum input power spectral density into the antenna flange of the hub earth station supporting the VSAT network does not exceed –14dBW/4kHz - 10log(N) for all methods of multiple access techniques where N is defined in paragraph (a)(1) of this section.

(6) If the maximum input power spectral density of an analog carrier into the antenna flange of a GSO FSS earth station antenna does not exceed – 8.0 dB(W/4kHz) and the maximum GSO FSS satellite EIRP spectral density does not exceed + 13.0 dB(W/4kHz).

(b) Each applicant for digital and/or analog VSAT network authorization proposing to use maximum input power spectral density at the antenna flange of the earth station or transmitted satellite carrier EIRP spectral density in excess of those specified in paragraph (a) of this Section must comply with the procedures set forth in § 25.220 of this Chapter.

(c) An application for VSAT authorization shall be filed on FCC Form 312, Main Form and Schedule B.

§25.201 Definitions

(10) Full Transponder. Radio emissions or transmissions that occupy, or nearly occupy, the entire satellite transponder power and/or bandwidth.

~~(18) Narrowband. Radio emissions or transmissions with narrow or limited spectral bandwidths. Narrowband satellite transmissions generally provide a single channel or a very limited number of channels. Narrowband satellite transmissions generally have bandwidths of 40 kHz to 5 MHz.~~

~~(41) Wideband. See Full Transponder.~~

§25.209 Antenna performance standards.

(a) The gain of any antenna to be employed in transmission from an earth station in the geostationary satellite orbit fixed-satellite service (GSO FSS) shall lie below the envelope defined as follows:

(1) In the plane of the geostationary satellite orbit as it appears at the particular earth station location:

29 - 25 log10 (Theta) dBi	1° </= Theta </= 7°
+8 dBi	7° < Theta </= 9.2°
32 - 25 log10 (Theta) dBi	9.2° < Theta </= 48°
-10 dBi	48° < Theta </= 180°

where Theta is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above for Theta between 1.0 and 7.0 degrees. For Theta greater than 7.0 degrees, the envelope may be exceeded by no more than 10% of the sidelobes, provided no individual sidelobe exceeds the gain envelope given above by more than 3 dB.

(2) In all other directions, or in the plane of the horizon including any out-of-plane potential terrestrial interference paths:

Outside the main beam, the gain of the antenna shall lie below the envelope defined by:

32 - 25 log10 (Theta) dBi	1° </= Theta </= 48°
-10 dBi	48° < Theta </= 180°

where Theta and dBi are defined above. For the purposes of this section, the envelope may be exceeded by no more than 10% of the sidelobes provided no individual sidelobe exceeds the gain envelope given above by more than 6 dB. The region of the main reflector spillover energy is to be interpreted as a single lobe and shall not exceed the envelope by more than 6 dB.

(b) The off-axis cross-polarization gain of any antenna to be employed in transmission from an earth station to a space station in the domestic fixed-satellite service shall be defined by:

19 - 25 log10 (Theta) dBi	1.8° < Theta </= 7°
-2 dBi	7° < Theta </= 9.2°

(c) Earth station antennas licensed for reception of radio transmissions from a space station in the fixed-satellite service are protected from radio interference caused by other space

stations only to the degree to which harmful interference would not be expected to be caused to an earth station employing an antenna conforming to the reference patterns defined in paragraphs (a), (b), and (g)(1)(ii) of this section, except the reference pattern starts at 1.25 degrees instead of 1 degree as stipulated in paragraph (a) of this section for antennas in the 12 GHz band with dimensions of less than 1.8 meters in the geostationary satellite orbital plane, and protected from radio interference caused by terrestrial radio transmitters identified by the frequency coordination process only to the degree to which harmful interference would not be expected to be caused to an earth station conforming to the reference pattern defined in paragraph (a)(2) of this section.

(d) The patterns specified in paragraph (a) or (g) and paragraph (b) of this section shall apply to all earth station antennas after [insert date of Commission's Report and Order].

(e)(1) The operations of any transmitting earth station with an antenna not conforming to the standards of paragraph (a) or (g) and paragraph (b) of this section shall impose no limitations upon the operation, location or design of any terrestrial station, any other earth station, or any space station beyond those limitations that would be expected to be imposed by an earth station employing an antenna conforming to the reference patterns defined in paragraph (a) or (g) and paragraph (b) of this section.

(e)(2) The operations of any receiving earth station with an antenna not conforming to the standards of paragraphs (a), (b) and (g)(1)(ii) of this section shall impose no limitations upon the operation, location or design of any terrestrial station, any other earth station, or any space station beyond those limitations that would be expected to be imposed by an earth station employing an antenna conforming to the reference patterns defined in paragraphs (a), (b), and (g)(1)(ii) of this section, except the reference pattern starts at 1.25 degrees instead of 1 degree as stipulated in paragraph (a) of this section for antennas in the 12 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane.

(f) An earth station with a transmitting antenna not conforming to the standards of paragraph (a) or (g) and paragraph (b) of this section will be authorized upon finding by the Commission that the antenna will not cause unacceptable levels of interference under conditions of uniform 2º orbital spacing. An earth station antenna initially authorized on or before February 15, 1985 will be authorized by the Commission to continue to operate as long as such operations are found not to cause unacceptable levels of adjacent satellite interference. In either case, the Commission will impose appropriate terms and conditions in its authorization of such facilities and operations. The applicant has the burden of demonstrating that its transmitting antenna not conforming to the standards of paragraph (a) or (g) and paragraph (b) of this section will not cause unacceptable interference. This demonstration must comply with the procedures set forth in § 25.220 of this Chapter.

(g)(1)(i) The antenna performance standards of small antennas operating in the 14 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane shall start as follows:

for antennas with dimensions from 1.2 to less than 1.8 meters in the geostationary satellite orbital plane, at 1.25 degrees instead of 1 degree as stipulated in paragraph (a)(1) of this section, and in all other directions outside the main beam, at 3.0 degrees instead of 1 degree as stipulated in paragraph (a)(2) of this section,

for antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane, at 1.5 degrees instead of 1 degree as stipulated in paragraph (a)(1) of this section, and in all other directions outside the main beam, at 3.0 degrees instead of 1 degree as stipulated in paragraph (a)(2) of this section, and

for antennas with dimensions less than 1.2 meters in the geostationary satellite orbital plane not seeking ALSAT authorization, at up to 1.8 degrees instead of 1 degree as stipulated in paragraph (a)(1) of this section, provided that the satellite operator(s) of the satellite(s) with which the applicant is seeking authority to communicate has provided written confirmation from each of the adjacent satellite operators within 3 degrees that the antenna has been successfully coordinated.

(ii) In frequency bands between 11.7 GHz and 30 GHz not shared on a co-primary basis with terrestrial services, the antenna gain envelope as it appears at the particular earth station for small aperture antennas with dimensions of 1.8 meters or less in the geostationary satellite orbital plane at angles from 85 to 180 degrees from the axis of the main lobe shall lie below 0 dBi instead of –10 dBi as stipulated in paragraph (a)(1) of this section.

(2) Small antennas operating in the 12 GHz band with dimensions less than 1.8 meters in the geostationary satellite orbital plane shall be deemed to meet the receive antenna performance standards of Section 25.209(a) and (g)(1)(ii) for purposes of determining whether such antennas qualify for routine processing, as long as such antennas meet such standards starting at 2 degrees in the geostationary satellite orbital plane. For purposes of determining receive protection, as opposed to routine processing, protection will be provided for such antennas to the extent specified in Section 25.209(c).

(h) The gain of any antennas to be employed in transmission from a gateway earth station antenna operating in the frequency bands 10.7-11.7 GHz, 12.75-13.15 GHz, 13.2125-13.25 GHz, 13.8-14.0 GHz, and 14.4-14.5 GHz and communicating with NGSO FSS satellites shall lie below the envelope defined below:

$29 - 25\log(\theta)$ dBi	$1° \leq \theta < 36°$
-10 dBi	$36° \leq \theta \leq 180°$

where θ is the angle in degrees from the axis of the main lobe, and dBi refers to dB relative to an isotropic radiator. For the purposes of this section, the peak gain of an individual sidelobe may not exceed the envelope defined above.

§25.211: Analog Video Transmissions in the Fixed-Satellite Service.

(a) Downlink analog video transmissions in the band 3700-4200 MHz shall be transmitted only on a center frequency of 3700 + 20N MHz, where N=1 to 24. The corresponding uplink frequency shall be 2225 MHz higher.

(b) All 4/6 GHz analog video transmissions shall contain an energy dispersal signal at all times with a minimum peak-to-peak bandwidth set at whatever value is necessary to meet the power flux density limits specified in §25.208(a) and successfully coordinated internationally and accepted by adjacent U.S. satellite operators based on the use of state of the art space and earth station facilities. Further, all transmissions operating in frequency bands described in §25.208(b) and (c) shall also contain an energy dispersal signal at all times with a minimum peak-to-peak bandwidth set at whatever value is necessary to meet the power flux density limits specified in §25.208(b) and (c) and successfully coordinated internationally and accepted by adjacent U.S. satellite operators based on the use of state of the art space and earth station facilities. The transmission of an unmodulated carrier at a power level sufficient to saturate a transponder is prohibited, except by the space station licensee to determine transponder performance characteristics. All 12/14 GHz video transmissions for TV/FM shall identify the particular carrier frequencies for necessary coordination with adjacent U.S. satellite systems and affected satellite systems of other administrations.

(c) All initial analog video transmissions shall be preceded by a video test transmission at an uplink e.i.r.p. at least 10 dB below the normal operating level. The earth station operator shall not increase power until receiving notification from the satellite network control center that the frequency and polarization alignment are satisfactory pursuant to the procedures specified in §25.272. The stationary earth station operator that has successfully transmitted an initial video test signal to a satellite pursuant to this paragraph is not required to make subsequent video test transmissions if subsequent transmissions are conducted using exactly the same parameters as the initial transmission.

(d) An earth station may be routinely licensed for transmission of full-transponder analog video services provided:

(1) In the 6 GHz band, with an antenna dimension of 4.5 to 9 meters in the geostationary satellite orbital plane, the maximum power into the antenna does not exceed 26.5 dBW; or

(2) In the 14 GHz band, with an antenna dimension of 1.2 to 5 meters in the geostationary satellite orbital plane, the maximum power into the antenna does not exceed 27 dBW.

(e) Antennas with a dimension smaller than those specified in paragraph (d) of this section will not be routinely licensed for transmission of full transponder analog video services.

(f) Each applicant for authorization for analog video in the fixed-satellite service proposing to use transmitted satellite carrier EIRP densities, and/or maximum power into the antenna in excess of those specified in Section 25.211(d), must comply with the procedures set forth in § 25.220 of this Chapter.

§25.212 Narrowband Analog Transmissions and Digital Transmissions in the GSO Fixed-Satellite Service.

(a) Except as otherwise provided by these rules and regulations, criteria for unacceptable levels of interference caused by other satellite networks shall be established on the basis of nominal operating conditions and with the objective of minimizing orbital separations between satellites.

(b) Emissions with an occupied bandwidth of less than 2 MHz are not protected from interference from wider bandwidth transmissions if the r.f. carrier frequency of the narrowband signal is within ±1 MHz of one of the frequencies specified in §25.211(a).

(c) In the 12/14 GHz band,

(i) an earth station meeting the requirements of paragraph (a) or (g) and paragraph (b) of Section 25.209 may be routinely licensed under this Section 25.212 for transmission of narrowband analog services with bandwidths up to 200 kHz if the maximum input power spectral density into the antenna flange does not exceed -8 dBW/4 kHz and the maximum transmitted satellite carrier EIRP spectral density does not exceed 13 dBW/4 kHz,

(ii) an earth station meeting the requirements of Section 25.209(a) or (g) and Section 25.209(b) may be routinely licensed under this Section 25.212 for transmission of digital services if the maximum input power spectral density into the antenna of the earth station does not exceed –14dBW/4kHz - 10log(N) where N is defined in Section 25.134(a)(1) of this Chapter, or in the case of full transponder digital video services, the maximum power into the antenna flange does not exceed 27 dBW for an antenna with a dimension of 1.2 meters to 5 meters in the geostationary orbital plane, and, either

(1) the maximum transmitted satellite carrier EIRP spectral density does not exceed 9dBW/4kHz, or

(2) the maximum transmitted satellite carrier EIRP spectral density does not exceed 13dBW/4kHz and provided that the operator/licensee of the satellite(s) on which the applicant wishes to use such power level has successfully coordinated that power level with adjacent satellite operators.

Earth stations in the 14 GHz band not meeting the applicable requirements of clause (i) or (ii) are subject to the provisions of §25.220 of this chapter.

(d) In the 6 GHz band, an earth station with an antenna dimension of 4.5 meters or greater in the geostationary satellite orbital plane may be routinely licensed for transmission of SCPC services if the maximum input power spectral densities into the antenna flange do not exceed + 0.5 dB(W/4kHz) for analog SCPC carriers with bandwidths up to 200 kHz and do not exceed –2.7 – 10log(N) dB (W/4kHz) for digital carriers.

(i) For digital transmissions using frequency division multiple access (FDMA) or time division multiple access (TDMA) technique, N is equal to one.

(ii) For digital transmissions using code division multiple access (CDMA) technique, N is the likely maximum number of co-frequency simultaneously transmitting earth stations in the same satellite receiving beam.

In the 6 GHz band, antennas with a dimension smaller than 4.5 meters in the geostationary satellite orbital plane are subject to the provisions of §25.220 of this chapter.

(e) Each applicant for authorization for narrowband analog transmissions and/or digital transmissions in the fixed-satellite service proposing to use transmitted satellite carrier EIRP densities, and/or maximum antenna input power densities in excess of those specified in paragraph (c) of this Section for Ku-band service, or paragraph (d) of this Section for C-band service, respectively, must comply with the procedures set forth in § 25.220 of this Chapter.

§ 25.220 Non-conforming transmit earth station operations in the C and Ku bands.

(a)(1) This Section 25.220 applies to earth station applications for antennas proposed to operate in the C band and/or Ku band in which:

(i) the transmit portion of the proposed antenna does not conform to the standards of §25.209(a) or (g) and §25.209(b) of this Chapter, and/or

(ii) the proposed transmit power density levels are in excess of those specified in §25.134, §25.211, or §25.212 of this Chapter, or for antennas proposed to transmit in the 6 GHz band, those derived by the procedure set forth in paragraph (c) of this Section, whichever is applicable.

Protection from interference will be provided for the receive portion of such antennas to the extent specified in Section 25.209(c), and routine processing for the receive portion of such antennas will be determined in accordance with Section 25.209(g)(2).

(2) The requirements for petitions to deny applications filed pursuant to this section are set forth in Section 25.154 of this Chapter.

(b) If the transmit portion of the antenna proposed for use by the applicant does not comply with the antenna performance standards contained in §25.209(a) or (g) and §25.209(b), the applicant must provide, as an exhibit to its FCC Form 312 application, the antenna gain patterns specified in §25.132(b) of this Chapter.

(c) If the transmit portion of the antenna proposed for use by the applicant in the 6 GHz band does not comply with the antenna performance standards contained in §25.209(a) and (b), the applicant must meet the requirements of either this paragraph (c) or paragraph (d)(1) of this Section, as applicable, to obtain authority to transmit.

The applicant must provide:

(i) in its Form 312, Schedule B, the power and power density levels that result by reducing the values stated in §25.134, §25.211, or §25.212, whichever is applicable, by the number of decibels that the non-compliant antenna fails to meet the antenna performance standards of §25.209(a) and (b), and

(ii) statement(s) that the operator(s) of the satellite(s) with which the applicant is seeking authority to communicate has obtained from the adjacent satellite operators within 3 degrees, indicating that the operation of the proposed antenna has been coordinated.

(d)(1) If the transmit portion of the antenna proposed for use by the earth station applicant does not comply with the antenna performance standards contained in paragraph (a) or (g) and paragraph (b) of Section 25.209, and paragraph (c) of this section does not apply, and/or the antenna has transmitted satellite carrier EIRP densities, and/or maximum input power spectral density into the antenna flange in excess of the levels in §25.134, §25.211, §25.212, the following statements shall be provided as an exhibit to the earth station application:

(i) a statement from the satellite operator acknowledging that the proposed operation of the subject non-conforming earth station with its satellite(s) has the potential to create interference to adjacent satellite networks that may be unacceptable.

(ii) statement(s) that the operator(s) of the satellite(s) with which the applicant is seeking authority to communicate has obtained from the adjacent satellite operators within 6 degrees, indicating that the operation of the subject non-conforming Earth Station has been coordinated.

(iii) a statement from the satellite operator that it will include the subject non-conforming Earth Station operations with respect to the antenna performance standards referenced in paragraph (d)(1) of this section, power and power densities in all future satellite network coordinations, and

(iv) a statement from the Earth Station applicant certifying that it will comply with all coordination agreements reached by the satellite operator(s).

(2) A license granted pursuant to paragraph (d)(1) of this section will include, as a condition on that license, that if no good faith agreement can be reached between the satellite operator and the operator of a future 2° compliant satellite, the earth station operator shall reduce its power to those levels that would accommodate the 2° compliant satellite.